

CRASH COURSE IN ORAL SURGERY



DENTISCOPE

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Instruments – general

Scalpel (handle and blade) – to make **incisions in the tissue**

Most common handle is **bard parker No. 3** (because the tip can receive different blades)



Blade	Function
#15	Most common type , make incisions around teeth on alveolar ridges and alveolar mucosa.
#11	To make small incisions like incising an abscess
#12	Make incisions in gingival sulcus, incisions posterior to the teeth in the maxillary tuberosity area



periosteal elevators:

Molt No.9 :

- Pointed : elevate interdental papilla
- Broad end : elevate mucoperiosteum from bone.

Freer: to reflect gingiva around tooth before extraction

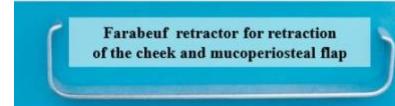
Seldin elevator: reflection and retraction of the flap



Retractors:

Retract cheek , tongue and mucoperiosteal flap to:

- Provide access for better visibility
- Protect tissue from sharp cutting instruments
- ❖ **Minnestoa:** retract the cheek , tongue, flap
- ❖ **Farabeuf :** retract the cheek and flap
- ❖ **Weider :** retract the tongue



Tissue forceps: to hold the tissue during suturing and during biopsy, grasp small instruments

Bone burs: to remove bone

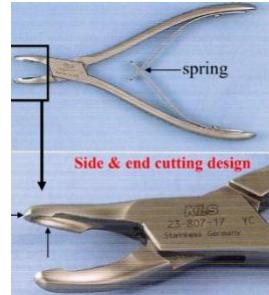
Irrigation during bone removal is needed to :

- 1- Cool down the bur and prevent over heating of the bone
- 2- Irrigate under the flap to remove any debris
- 3- Increase efficiency of cutting by removing bone chips from the flutes



Rongeur forceps (bone cutter / bone nibbler) – to remove bone (side or side and end cutting)

Bone file: to smoothen bone not to remove large pieces of bone (many small parallel blades) – activated only by pull action



Bone mallet and chisel: to remove bone or for sectioning bone / teeth (**bi beveled** are to section multi rooted teeth)

*mostly used for lingual tori removal

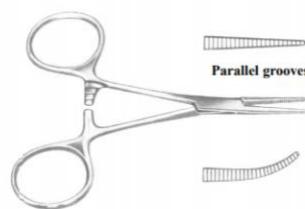


Periapical curettes: to remove periapical granulation tissue, cysts , bone chips, forgein bodies



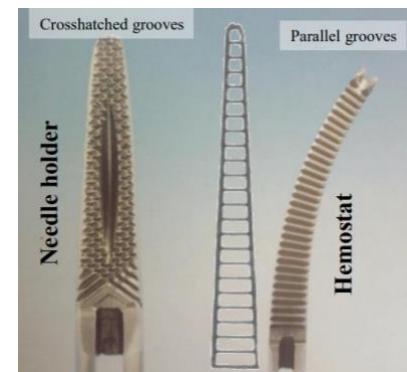
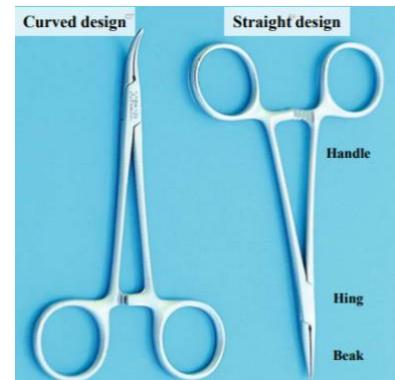
Hemostat [artery forceps]:

- Bleeding control by clamping the bleeding vessel + hold tissue during biopsy, draining and abscess.
- Curved (mosquito) design is most common
- The beaks have parallel grooves



Needle holder:

- Hold needle during suturing
- The beak has crosshatched grooves





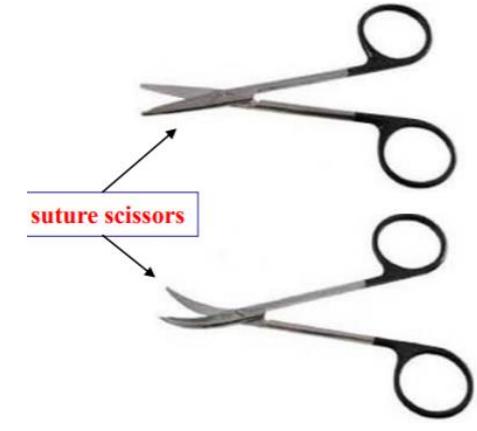
Castroviejo needle holder:

- Hold the needle during suturing
- Has **microtip to suture fine surgical sites**



Suture scissors:

- Cut sutures
- short cutting blades and long handle



Soft tissue scissors:

- removing excess gingival tissue, dissecting and undermining the mucosa from the underlying soft tissues.
- **long cutting blades with sharp or rounded tips**



Castroviejo micro scissors:

- extremely Smooth cutting of fine and coarse tissue with reduced trauma



Instruments – sutures and surgical packs

Local hemostatic agents: for local use to stop the bleeding from injury to small Bvs - fully absorbed in the tissue within weeks.

To control bleeding from extraction sockets [all resorbable]

- Collagen sponge



- oxidized cellulose (surgical)



- Gelatin sponge (Gelfoam)



[non resorbable]

Bone wax:

- stop bleeding that originates from bone or chipped bone edges
- mechanism of action : by mechanical obstruction of the bony cavity that contains the bleeding



Vaseline gauze :

- cover exposed wounds, bone cavities (after cyst removal)

Idoform paste & gauze:

- antiseptic , analgesic and hemostatic
- cover exposed wounds, bone cavities and treatment of dry socket

surgical dressing [septo pack / co pack] : cover exposed wounds [specially in perio surgery]

Sutures

Ideal Suture material:

- 1- Non toxic / non allergic
- 2- No wicking effect [does not allow fluids to pass through them]
- 3- Strong
- 4- Flexible [to be easily tied]

Why do you need to suture?

- 1- Reapproximating the wound edges together until healing occurs.
- 2- Protecting underlying tissues from infection or other irritating factors.
- 3- Preventing postoperative hemorrhage.

Suture diameter : noted by number of zeros [the more zeros the smaller the diameter – in surgery we use mostly 000 or 3-0]



Sutures

Resorbable	Non resorbable
<p>For : Internal tissues of the body , Children, mentally handicapped or patients who cannot return to the clinic to have the sutures removed</p> <ul style="list-style-type: none"> Plain catgut [from sheep's intestine] Dissolves after 3-5 days Chromic catgut Dissolves after 7- 10 days polyglycolic acid (Dexon) polyglactin (vicryl) dissolves after 30 days 	<ul style="list-style-type: none"> silk [most common] cheap , easy to use and good to hold a knot nylon st steel



3-0 (0.0 metric)
27" (70 cm) CHROMIC GUT
SH 26 gauge 1/2 circle
G122

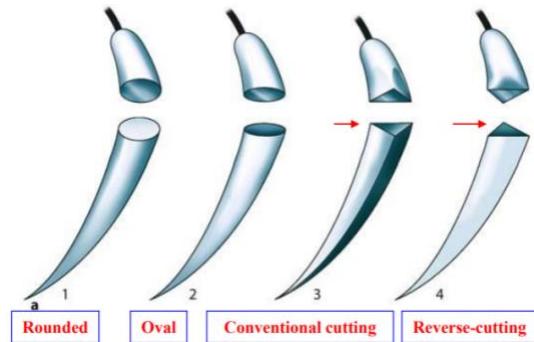


BRAIDED CE 0197
3/0 RC 75cm 18mm
STERILE
SILK BLACK
Made in China
www.suturingdoctor.com

Poly filament	Mono filament
Easier to tie The cut ends are soft and nonirritating to the tissues Wicking effect	No wicking Difficult to tie+ tend to come untied The cut ends are stiffer and more irritating to the tissues

Needles

- A. round needles :**
 atraumatic and are mainly used for suturing thin mucosa **BUT** Pressure is required when passing through the tissues
- B. Triangular cross section :**
 sharp cutting edges for suturing thicker tissues.
If used for thin mucosa, tearing may occur.
- Conventional cutting:** cutting edge (apex of the triangle) on the inside of the semicircle.
 - Reverse cutting:** cutting edge outside of the semicircle



Suturing principles

- The needle should pass from the **mobile tissue toward the fixed tissue** and be at least 5 mm **from the edges**.
- Avoid over tightening the sutures (risk of tissue necrosis).**
- The two ends of the suture are tied in a knot and are **cut 5 mm above the knot**.
- The knot should be placed to the side but not over the incision** since it will act as a stagnant area for debris.



Suture types :

A. Simple interrupted:

Advantage : if placed in a row loosening of one stitch will not influence the rest



B. Continuous :

usually used for suturing long incision [incision for reshaping of the alveolar ridge]



Advantage: Quick, with few knots to collect debris.

Disadvantage: if one stitch get cut or loose, the entire suture line becomes loose

C. Figure of 8:

To maintain the blood clot / hemostatic material in the alveolar socket after extraction.



D. Horizontal mattress suture:

When you need tight re approximation



You Can watch our videos :

Overview of Armamentarium for Oral Surgery:

<https://youtu.be/72dyW5h3MIM>



Dentiscope | Overview of Armamentarium for Oral Surgery

Armamentarium for Oral Surgery - Part1 :

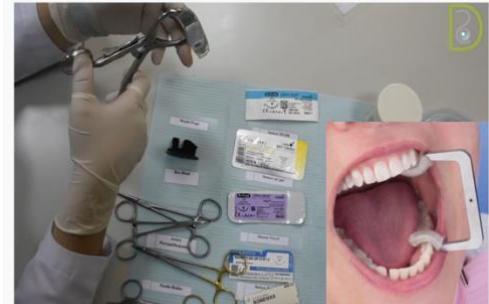
<https://youtu.be/JXVqnKgkG9g>



Dentiscope | Armamentarium for Oral Surgery - Part1

Armamentarium for Oral Surgery - Part2 :

<https://youtu.be/9goRmw5HR18>

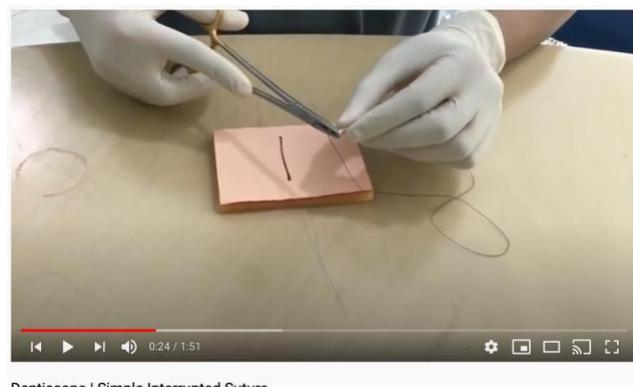


Dentiscope | Armamentarium for Oral Surgery - Part2



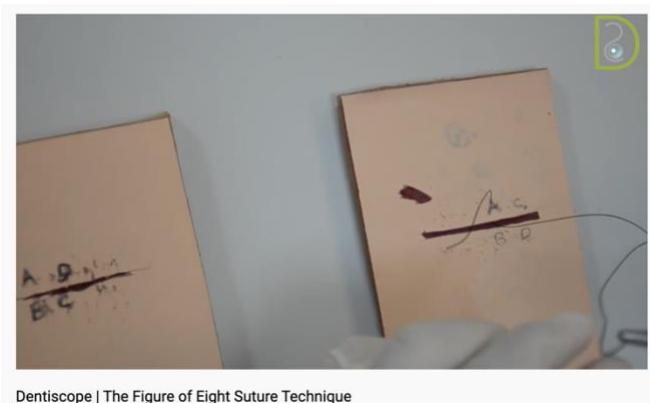
Simple Interrupted Suture :

<https://youtu.be/OOn7ajbomiQ>



Continuous Suture Technique :

<https://youtu.be/KB7hiu8izJl>



The Figure of Eight Suture Technique :

<https://youtu.be/COZNc6wF2sc>



Simplifying Suturing Techniques with ABCD Rule :

<https://youtu.be/dSqX0-ZL9Zk>





Instruments – extraction

Conventional exo = Forceps and elevator

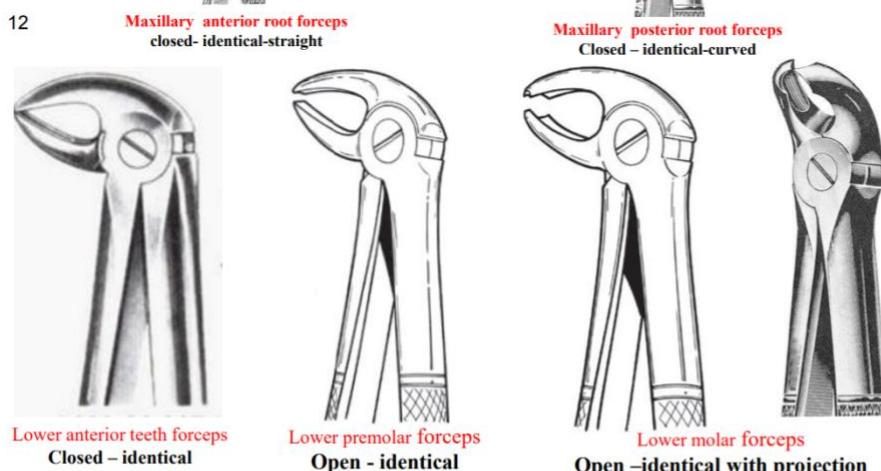
Beaks of the forceps are parallel to the handle in max forceps and perpendicular to the handle in mand forceps



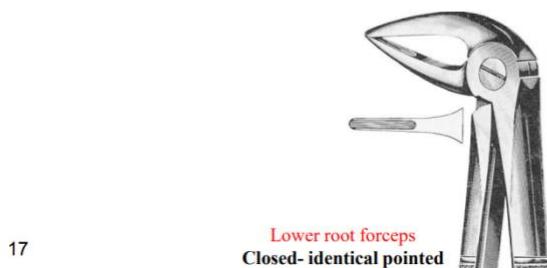
Curvature of the beaks is to compensate for lips and cheeks and get parallel application of the beaks to the long axis of the tooth .



Projection in maxillary molar forceps engages the buccal bifurcation



Projection in lower molar forceps to engage the bifurcation (no right and left- can be used for both sides)



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elevators= luxate and loosen the tooth before using forceps , root separation and deliver roots from the socket after separation

- **Coupland's chisel elevator** = straight end straight elevator = rounded end (both come in 3 sizes)
- **Cryer's elevator** = only for lower roots or lower 3rd molar exo (Mesial and distal)
- **Winter's T elevator** = same as cryer's but with T handle (generates more force) (mesial and distal)
- **Apexo elevator** = to remove root tips in both jaws (mesial and distal)
- **Warwick James** = exo of max 3rd molars or deciduous molars
- **Periotomes and desmotomes** = gingival separation around the tooth
- **Root extractor** = to extract roots below the alveolar crest
 - 1- Lever action → elevators
 - 2- Wedge action → forceps (when they are forced into the PDL space causing expansion of the bone) + straight elevators
 - 3- Wheel and axle → cryer's elevator (handle = the axle / tip = the wheel)

Q: why do you need to apply apical pressure with the forceps? To expand the bone by wedging action + push the center of rotation of the tooth more apically (less fracture)

- Buccal pressure = expand buccal bone crestally and lingual bone apically
- Palatal pressure = expands palatal bone crestally and buccal bone apically

** excessive buccal or palatal pressure can fracture the bone plate or the apical root portion

- Rotational pressure = internal expansion of the tooth socket
- Tractional force = to deliver the tooth from the socket

NOTE:

- In the maxilla buccal bone is thin and palatal bone is thick → more buccal pressure
- In the mandible buccal bone is thin anteriorly and thick posteriorly → anteriors and premolars are removed with more buccal pressure , molars are removed with more lingual pressure

Elevators : held in the palm and finger on the handle to avoid slippage and injury

Always applied to mesial or distal buccal side (between tooth and alveolar bone) – never use adjacent tooth as fulcrum this will lead to damage to PDL of adjacent tooth (you can only do this if the adjacent tooth is going to be extracted as well)

- Conventional extractions are called = closed technique
 - Open = flap technique/ surgical
- ALWAYS CHOOSE THE LEAST TRAUMATIC TECHNIQUE



You Can watch our vidoes :

Exodontia Instruments

(Forceps) - Part 1 :

<https://youtu.be/aEnjGMWLHjE>



Dentiscope | Exodontia Instruments (Forceps) - Part 1

Exodontia Instruments (Elevators) - Part 2 :

<https://youtu.be/8ha9LsafhH8>



Dentiscope | Exodontia Instruments (Elevators) - Part 2



Extraction guidelines

Reasons for extractions :

- 1- Non restorable tooth (Gross caries , pulp necrosis / apical pathology, periodontal disease with bone loss and mobility, cracked teeth)
- 2- Orthodontic reasons (crowding) / prosthodontic reasons (over erupted tooth)
- 3- Malposed teeth like upper 3rd molars causing buccal ulcerations
- 4- Impacted and supernumerary teeth
- 5- Teeth associated with pathological lesions (if they compromised the removal of the lesion, otherwise they can be left and root filled)
- 6- For prophylaxis (before radiation)
- 7- Teeth involved in jaw fractures (because it will affect the management of the fracture)
- 8- Patient preference and financial status

Systemic contraindication for exo	Local contraindication for exo
<ol style="list-style-type: none"> 1- Uncontrolled metabolic disease (diabetes, end stage renal disease) 2- Uncontrolled leukemia and lymphoma (risk of bleeding and infection) 3- MI in the last 6 months 4- Unstable angina 5- Bleeding disorders like hemophilia (unless u have prophylactic factor 8) 6- Pts on corticosteroids and immunosuppressive drugs 	<ol style="list-style-type: none"> 1- Previous radiotherapy in the area (risk of osteoradionecrosis) 2- Teeth in the area of a tumor (risk of tumor metastasis) 3- Acute pericoronitis 4- Acute abcess (trismus and difficult to achieve anaesthesia)

Q:What do you asses before exo ?

Clinically	Radiographically
<ol style="list-style-type: none"> 1- Mouth opening (whether there is any limitation in mouth opening) 2- Location/ position of the tooth and access (anteriors = better access than posteriors, well aligned better adaptation of the instruments than malposed teeth) 3- Tooth mobility 4- Crown of the tooth (presence of any large restorations, large carious lesions , RCT , large calculus that will interfere with forceps placement and can settle inside the socket after exo) 5- Adjacent teeth (large carious lesions or large restorations, RCT) 6- Check if there is apical pathosis / TTP(by pain on apical pressure and radiograph 	<ol style="list-style-type: none"> 1- Number of roots 2- Root curvature (curved roots = higher risk of fracture) 3- Divergence (divergent roots = more difficult, convergence = easier) 4- Size of the roots (smaller roots = easier, bulbous roots = more difficult) 5- Root caries / root resorption (weaker root = easier to fracture) 6- Relationship to max sinus, IDC, mental foramen) ** premolars are closer to mental foramen 7- Presence of apical pathology 8- Bone density (radiolucent = easier exo)



Extraction – closed technique [intraalveolar]

Extraction – closed technique [conventional]:

You must have clear visualization + appropriate access

- 1- Check anesthesia (probe inserted inside the sulcus)
 - 2- Gingival separation using periotome/ periosteal elevator (to ensure profound anesthesia + allow apical positioning of elevators + forceps)
 - 3- Luxation using elevators (to tear all PDL fibers + expand the socket)
 - 4- Forceps adaptation gradually as apical as possible (to further expand the socket by wedging effect and move the center of rotation apically to reduce risk of fracture)
 - 5- Buccal and palatal pressure with steady controlled force (to further expand the bone and tear all fibers)
 - 6- Tractional force buccally
- **Chair position for maxillary exo :** tipped back so that the occlusal plane is at 60 degrees to the floor
 - **Chair position for mandibular exo:** more upright so that the occlusal plane is parallel to the floor

In both the height should be that the patient's mouth is at the level of the doctor's elbow (but height is slightly lower for the mandibular teeth)

You always stand in front of the patient on the right side except if you are extracting the lower right side you stand behind the patient on the right side

- **Common complication in max lateral exo** → fracture of the curved root tip (root is curved palate-distally)
- **Common complication in max canine exo** → thin labial bone and the root is long and firmly attached in the bone → risk of labial bone fracture

You can apply rotational force only when the tooth is single rooted.

What modifications would you do for pedo extractions?

To avoid extracting the permanent bud with the deciduous molars → place the forceps mesially or distally not in the bifurcation area or sectioning the tooth

Q: what do you check after exo? Post extraction socket care

- 1- Examine the root (sharp means fractured root and smooth means resorbed root)
- 2- Examine the socket for any granulation tissue, bone pieces , root remnant, broken fillings , sharp bone etc
- 3- Examine if tissue tears need suturing
- 4- If there was a PA radiolucency before you curette the socket to remove it other wise it turns into residual cyst
- 5- If upper tooth check for OAF by nose blowing test
- 6- Squeeze the buccal and lingual bone plates to control hemorrhage and compress the expanded bone socket



Post extraction instructions:

- 1- Take analgesics as soon as possible
- 2- Avoid exercise and physical activity for 24 hours to avoid bleeding again
- 3- First 24 hours only cold liquids, cold food
- 4- Avoid smoking and alcohol
- 5- No mouth rinsing for 24 hours (tooth brushing can be resumed after 24 hours)

Order of tooth extraction:

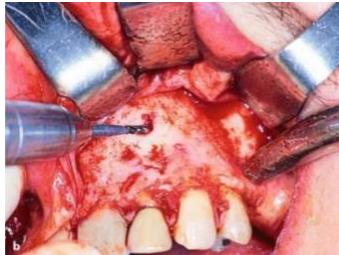
- **Upper before lower** (because max anesthesia is by infiltration which has rapid onset of action + if you extract the lower first debris from upper extraction will fall into the empty socket BUT bleeding from the upper affects the visualization in the lower)
- **Most posterior to most anterior** (so bleeding doesn't affect the visualization of the field)
- **Number of teeth to extract per visit depends on the general state of the patient and difficult of extraction**



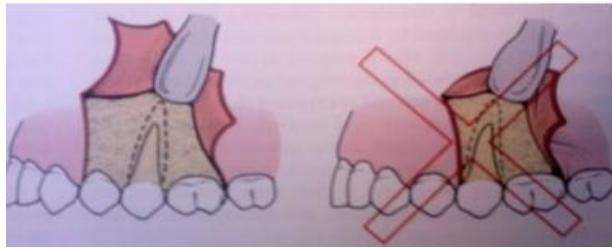
Flaps and incision design

Principles of incision design :

- 1- incisions made with **firm continuous strokes**, scalpel should be in constant contact with bone
- 2- incisions should **avoid damage to vital structure like nerves, glands and Bvs**
- 3- flap should **extend one or 2 teeth from each side of bone removal to avoid tension and trauma**
- 4- The **base of the flap should be broader than the free gingival margin** to ensure good blood supply and healing
- 5- **Width of the base should be more than the length** to ensure good blood supply and healing
- 6- the flap should be bigger than the bone defect itself – so that margins after suturing rest on **healthy bone [to prevent wound dehiscence]**
- 7- **mucosa and periosteum should be reflected together** (deep incisions and periosteal elevator pressed firmly against the bone)
- 8- during flap reflection **avoid excessive pulling** so you don't compromise blood supply



Excessive flap pulling → compromised blood supply and healing



Flap margin not resting on intact healthy bone



Flap base is narrower than free gingival margin

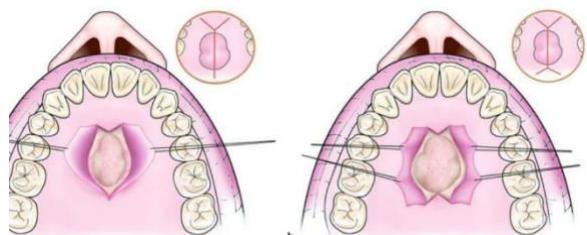


Flap type

FLAP TYPE	TRAPEZOIDAL	TRIANGULAR	ENVELOPE FLAP	SEMILUNAR
SIDES	3 sided One horizontal and 2 vertical	2 sided One horizontal and one vertical	One sided (gingival flap) Over 4 or 5 teeth if the ridge is edentulous incision is made over crest of the ridge	Curved Below the vestibular fold – The lowest point of the incision must be at least 0.5 cm from the gingival margin , so that the blood supply is not compromised.
BLOOD SUPPLY	Limited	Adequate	Adequate	Adequate
REFLECTION	Easy	Easy	Difficult	Easy
TENSION	No tension	Tension with tear possibility	Tension with tear possibility	Tension with tear possibility
ACCESS	Excellent	Good	Limited	Limited
GUM AFFECTED	Yes	Yes	Yes	No
MODIFICATION POSSIBILITY	No	Yes	Yes	No
USE	Extensive surgical procedures		Mostly in the palate to remove impacted teeth	Apicectomies, removal of small cysts and root tips
ADVANTAGES	No tension when flap is retracted Excellent access Allows surgery on more than one tooth	Adequate blood supply Good access Easily modified by adding a vertical incision or lengthening horizontal incisions	Adequate blood supply Avoid vertical incisions Easy re approximation Easily modified	Small incision Easy to reflect Doesn't interfere with oral hygiene Doesn't affect the gingiva (no recession)
DISADVANTAGES	Causes gingival recession	Causes gingival recession Limited access to long roots Tension during retraction	Causes gingival recession Limited access Difficult reflection Great tension during retraction	Limited access Tension and tear can be mistakenly located over the bone defect due to miscalculation

** any flap that involves the gingival margin will cause recession – vertical incisions in any flap should never be placed in the center of the labial surface and should always extend to the interdental papilla

Elliptical incision: for biopsies – 2 incisions that meet at an acute angle



Y or double Y shaped incisions : for removal of bony exostoses



Extraction – open technique [transalveolar]

Complicated extractions that can still be done by non surgical technique:

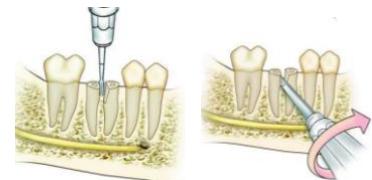
1- Extraction of Single Rooted Teeth with Destroyed Crown:

- A. If the level of the root is above or with the level of the bone → use straight elevator
- B. If the level of the root is with the level of the bone or slightly below → apply the root forceps and grasp a small portion of the alveolar bone then the root is removed along with that small portion bone. [avoid this method if you are going to place implants]

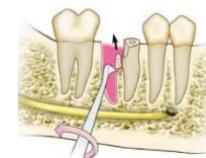
2- Extraction of multi rooted Teeth with Destroyed Crown:

If the level of the root is above or with the level of the bone →

Mandibular molar : separate the roots using fissure bur or straight elevator placed in the bifurcation [separation is buccolingually]



- The root may be removed with the straight elevator during root separation or root forceps can be used to remove each root separately
- The other root can be removed :
 - using **the cryer's elevator** [positioned in the empty socket with its end facing the root + The interradicular bone is removed first and then the elevator contacts the root, which is removed after applying rotational pressure upwards]
 - using **straight elevator** applied on one side and pushing the root towards the other socket.



Maxillary molar: using bur or straight elevator → **first separate palatal from buccal roots, then section the buccal roots into mesiobuccal and distobuccal one.**

Then each root is removed separately by elevator or root forceps

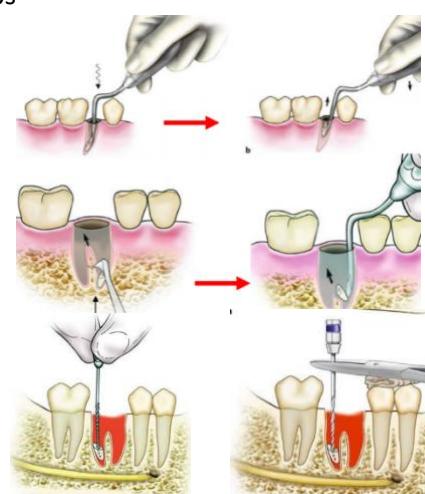
3- Extraction of root tip:

A. Using **apexo elevator**

Sometimes a piece of the interradicular bone might be removed as well to allow space for removal of the root tip

B. Using **endodontic file**, placed inside the socket and then screwed into the root canal, then either delivered it by hand or with a needle holder [you need primary mobility of the root + good visibility of the field and the root canal]

C. **Irrigation –Suction Technique** : when the tooth was well luxated and mobile before the root was fractured . The socket is irrigated vigorously and suctioned with **fine suction tip** .



Q: How can you extract a root tip that broke when you were trying to

? using apexo elevator, endo file or irrigation suction technique [if the tooth was well luxated before fracture]

extract a tooth

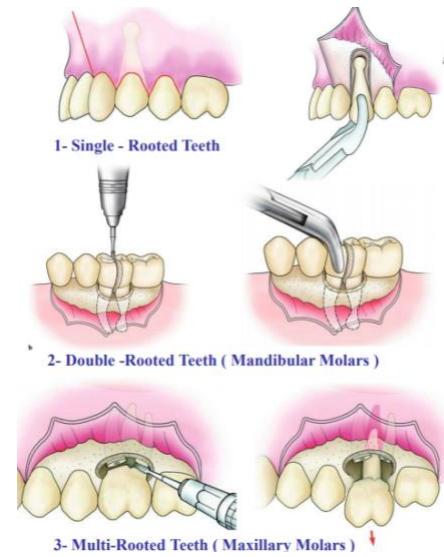


Surgical extractions

Indications	Contraindications
<ul style="list-style-type: none"> 1- Teeth with unusual root morphology [hypercementosis , bulbous roots , dilacerations, dense en dente , ankylosed roots] 2- Impacted and semi-impacted teeth. 3- Fused teeth. 4- Maxillary posterior teeth, whose roots are divergent and included in the maxillary sinus or in case of pneumatization of the maxillary sinus 5- Broken root tip that have remained in the alveolar bone + associated with pathology 6- Roots with periapical lesions, that cannot be removed through the socket or with curettage alone 7- Deciduous molars whose roots embrace the crown of the permanent. 	<ul style="list-style-type: none"> 1- Asymptomatic fractured root tips that are not associated with periapical pathology 2- Root tips located deep in the socket 3- Small size root tip (not more than 3-4 mm) 4- older patients. 5- There is a risk of serious local complications, such as the dislodging of a root tip into the maxillary sinus or injury of the inferior alveolar nerve, mental nerve, or lingual nerve. 6- A large part of the alveolar process needs to be removed. 7- Immunocompromised pt

Surgical Extraction of Teeth

- 1- Flap is made (envelope, 2 or 3 sided)
- 2- Remove buccal bone (**just below the root bifurcation in multi rooted**).
 - A- **In single rooted teeth:** push the root using forceps or elevators towards the buccal side
 - B- **In double rooted teeth:** The roots are separated, then each root is removed separately.
 - C- **In multi rooted teeth:** The two buccal roots are sectioned , the crown together with the palatal root is removed, then the two buccal roots are removed separately
- 3- The flap is replaced and sutured.



Surgical Extraction of Root [3 techniques]

- A- **Removing part of the buccal bone [applicable anywhere / fresh and old sockets]**
 - 1- Flap is made (2 or 3 sided)
 - 2- Remove buccal bone using a round bur until the root is exposed The root is luxated and removed out using a straight elevator
 - 3- Remove all bony spicules and smoothen any sharp bony edges
 - 4- Irrigate with saline under the flap
 - 5- The flap is replaced and sutured.



** in case of multi rooted teeth → after bone removal separate the roots and luxate out



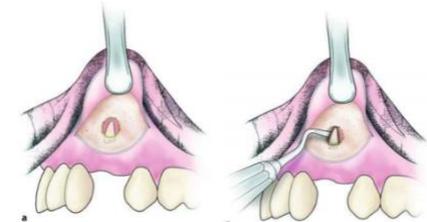
- B- Opening a window through the buccal bone [applicable only in the maxilla or mand anterior]**
the removal of the root is achieved either through the socket itself or through the window

Through the socket: indicated for the removal of roots immediately after their fracture (the socket still open).

- 1- Flap is made (2 or 3 sided flap)
- 2- A small window is created, using a round bur, on the labia/buccal bone corresponding to **the tip of the fractured root.**
- 3- using an angled elevator (like apexo or curved warwick james) displace the root through the socket



Through the window created : indicated for removal of fractured small roots which were not removed during the extraction and are totally covered by bone



- 1- **semilunar flap**
- 2- small window is created, using a round bur, on the labial/buccal bone corresponding to the tip of the fractured root.
- 3- The root is then removed from the window using a angled elevator

- C- Creation of a groove on the surface of the root or between the root and bone used in the lower posterior teeth, where the buccal bone is dense and can withstand the pressure.**

Flap is made - envelope or 2 sided flap.

- A. Buccal bone is removed until root is exposed → a groove created on root surface to allow the elevator to luxate the root outwards.
- B. A groove is created between the buccal bone and the root → enough room for the elevator to luxate the tooth

Q: how can you extract a root tip surgically?

- A. Flap + removing buccal bone and remove the root - can be used anywhere with fresh or old exo socket
- B. Flap + opening a window in the buccal bone [remove through the socket if done at the time of extraction or through the window if done later when the tip is surrounded by bone completely] – can only be used in the maxilla and mand anterior where bone is thin
- C. Flap + creating a groove on the root tip or between the root tip and the bone to allow space for the elevator [only in mand posterior teeth where buccal bone is dense and can withstand pressure]



Management of impacted teeth

Q: what is an impacted tooth ? a tooth that fails to erupt either because of lack of space, excessive overlying bone or soft tissue or pathology

Q: which teeth are mostly impacted ? 3rd molars [upper and lower] + maxillary canines + mandibular premolars

Q: should you always extract impacted teeth ? If the impacted tooth is causing problems you need to extract regardless of the difficulty of the surgery. BUT there are two opinions:

- A. Extraction of impacted teeth should be done as soon as their presence is confirmed because surgery is easier to perform on younger pts , less morbidity and they will recover better
- B. Deciding to remove an asymptomatic impacted tooth will subject the pt to unnecessary discomfort and risk of complications like nerve injury , mandible and maxillary tuberosity fractures etc.

Indications	Contraindications
<ul style="list-style-type: none"> 1- Obscure facial pain 2- Pericoronitis 3- Caries on the distal of the second molar or the impacted tooth itself 4- Bone loss on the distal of the second molar 5- Impacted tooth under a dental prosthesis 6- Obstruction of the normal eruption of other perm teeth 7- For orthodontic reasons [to prevent lower anterior crowding and allow the retraction of 1st and 2nd molars] 8- To prevent odontogenic cysts and tumors 9- To prevent root resorption of adjacent teeth 10- To prevent jaw fractures [the tooth occupies and area that should be filled with bone → weakens the jaw] 	<ul style="list-style-type: none"> 1- Old age [bone is more calcified and more bone has to be removed , more risk of complications] 2- Medically compromised 3- Probable damage to adjacent structures

Q: why should you extract impacted teeth that will be under dental prosthesis ? because after extraction there will be bone resorption and exposure of the impacted tooth [it will become closer to the surface] – the denture might compress the ST over the impacted tooth → ulceration

Q: why can't you extract the impacted tooth after denture construction? Because extraction will alter the alveolar ridge

if the follicular space around the crown of the tooth is greater than 3 mm → might indicate a dentigerous cyst

If a tooth has been impacted for many years without periodontal disease, caries, or cystic degeneration, it is unlikely that these problems will occur. Pt's above 35 with an impacted tooth that shows no signs of disease → the **tooth should not be removed**.

Q: if you decide to keep the impacted tooth how often should you check it radiographically? every 1 or 2 years to ensure that no adverse changes occur

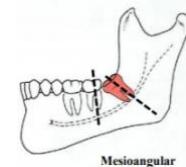


Impaction classification:

- 1- According to angulation :** compare the long axis of the impacted tooth with the long axis of the second molar - **provides some information about difficulty of extraction**

Mesio angular **The long axis of the third molar** is directed toward the second molar.

Most common and easiest impaction

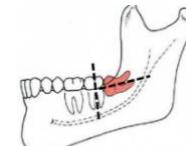


Mesioangular

Horizontal

The long axis of the third molar is **perpendicular to the second molar**

More difficult to remove

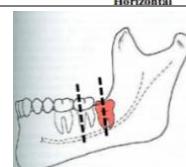


Horizontal

Vertical

The long axis of the impacted tooth runs **parallel to the long axis of the second molar**

More difficult

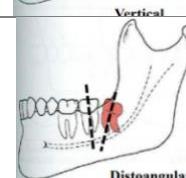


Vertical

Distoangular

The long axis of the third molar is **directed distally or away from the second molar**.

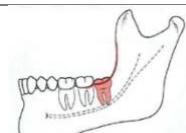
Most difficult one to remove because the **occlusal surface is usually embedded in ramus of mandible and requires significant bone removal for extraction.**



Distoangular

- 2- Relation ship to the anterior border of the ramus [pell and Gregory classification] :** based on the amount of impacted tooth covered with the bone of the mandibular ramus

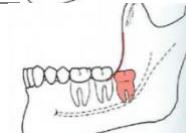
Class I **The crown is completely** anterior to the anterior border of the ramus
Easiest



Class 2 Half of the crown is covered by the ramus
More difficult

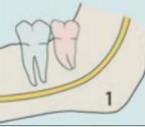


Class 3 Tooth is located completely within the ramus
most difficult





3-relationship to the occlusal plane [pell and Gregory classification]: depends on the depth of the impacted tooth compared with the level of the second molar.

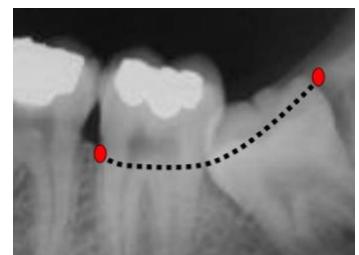
Class A	The occlusal plane of the impacted tooth is at the same level as occlusal plane of the second molar. Easiest	
Class B	The occlusal plane of the impacted tooth is between occlusal plane and cervical line of the second molar. More difficult	
Class C	The occlusal plane of the impacted tooth is below the cervical line of the second molar. Most difficult	

Q: How do you examine radiographs for impacted molars? Same way you examine radiographs for erupted teeth but you focus on:

1. Stage of tooth development [fully formed roots, partially formed only etc]
2. Level of bone surrounding the tooth
3. Angulation of impaction
4. Depth of impaction
5. shape size and number of roots
6. Relationship to the adjacent tooth
7. Size of the follicular sac [If the follicular sac is wide, less bone must be removed, which makes the extraction easier]
8. Root pattern of the second molar [If the second molar has conical root, it may be dislodged during removal of the third molar]
9. Density of the bone surrounding the tooth
10. Relationship to inferior dental canal

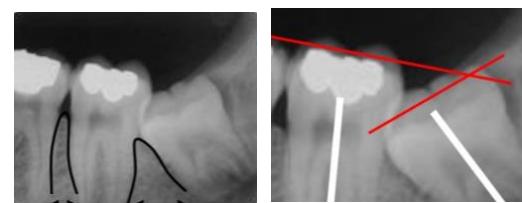
Q: how can you determine the amount of bone surrounding the impacted tooth

? By drawing a line from the bone distal to the third molar extending to the crest of the interdental bone between first and second molar. This line indicates the margin of bone enclosing the tooth [when the flap is reflected only the portion of the tooth above this line will be visible]



Q: how can you determine the impaction angulation?

- A. By comparing the anteroposterior width of the interdental bone between (second – third) molar and (first – second) molar.
If equal = vertical impaction
If more = mesioangular
If less = distoangular
- B. By drawing a line along the occlusal surfaces of the of the erupted molars, and another line along the occlusal surface of the impacted tooth, if the two lines are parallel, the tooth is vertical, otherwise mesioangular or distoangular impaction.
- C. By comparing the long axis of the impacted with the long axis of the second molar.





Q: how do you determine the depth of impaction? According to the level of the impacted tooth compared to the second molar. The occlusal surface of the impacted tooth is above, with or below the **cervical line** of the second molar.

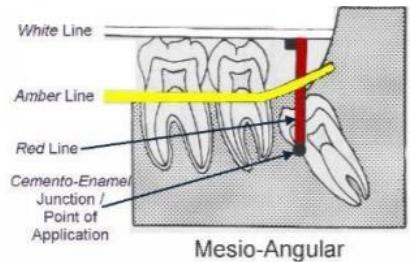
Another method = divide the root of the 2nd molar into thirds. A horizontal line is drawn from the point of application for an elevator to the 2nd molar. If the point of application is adjacent to the coronal 3rd → easy extraction, middle 3rd → moderate , apical third → difficult

Winter's lines:

These are 3 imaginary lines drawn on the dental X-ray (**normally an OPG**).

The position & depth of the mandibular 3rd molar can be determined

- **White Line:** It is drawn along the occlusal surfaces of the erupted lower molars & extended over the 3rd molar posteriorly. It **indicates the difference in occlusal level of the 1st & 2nd molars & the 3rd molar**
- **Amber Line:** It is drawn from the bone on the distal aspect of the 3rd molar to the crest of the inter dental bone between 1st & 2nd molars - **indicates the margin of bone covering the 3rd molar and indicates the amount of bone that will be removed for the tooth to come out.**
- **Red line:** It is drawn perpendicular from the amber line to an imaginary point of application of an elevator. [cemento-enamel junction of the impacted tooth] It **indicates the amount of bone that will have to be removed before elevation of the tooth [depth of the tooth in the jaw]**



If the red line increases in length by 1 mm → difficulty increases by 3 times

Q: what are radio graphic findings that indicate and intimate relationship with the IDC?

1. Loss of the tramlines
2. Narrowing of the tramlines
3. A sudden change in direction of the tramlines
4. A radiolucent band across the root

Q: mention factors that make the impaction difficult or easy ?

Difficult

- Mesio angular
- Class I ramus
- Class A depth
- Large follicle
- Roots one 3rd to two 3rd formed
- Elastic bone
- Wide PDL
- Separated from IDC
- Separated from second molar

**highlighted = found in young pts

Easy

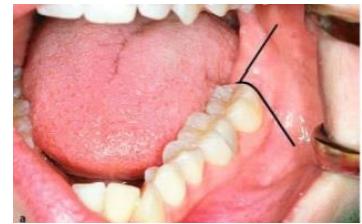
- Distoangular
- Class III ramus
- Class C depth
- Thin follicle
- Long thin roots
- Dense bone
- Thin PDL
- Close to the IDC
- Contact with second molar



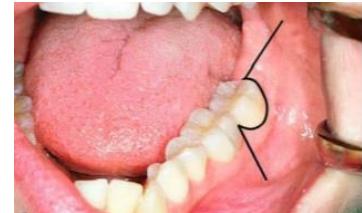
Types of flaps for surgical extraction of impacted teeth :

A. Triangular flap:

The incision begins at the **anterior border of the ramus** and extends to the **distal aspect of the second molar** - the **vertical incision is made obliquely downwards and forward, ending in the vestibular fold.**

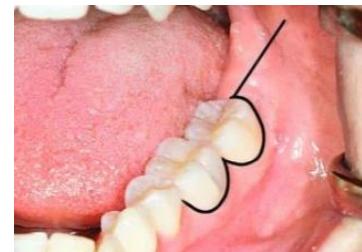


If the **impaction is deep or the impacted tooth is close to the roots of the second molar** → the incision **continues along the cervical line of the second molar** and the vertical incision begins at the distal aspect of the first molar.



B. Horizontal (envelope) flap: used in cases where impaction is relatively superficial

The incision begins at the **anterior border of the ramus** and extends to the **distal aspect of the second molar, continuing along the cervical lines of the molars, and ending at the mesial aspect of the first molar.**



Extraction of Partially Formed Impacted Mandibular Third Molar:

Triangular flap → bone covering the tooth is removed using a round bur, until the entire crown is exposed → bone guttering [remove bone from the buccal and distal aspects of the crown creating a groove] → elevate the tooth using elevator placed mesially → remove follicular sac → check for sharp bone edges and smoothen them → saline irrigation → suture



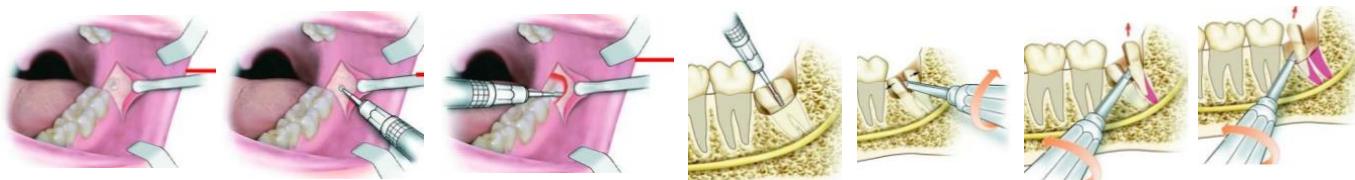
Q: what is the importance of bone guttering? Create unobstructed pathway for removal and point of application for the elevator



Extraction of Mandibular Third Molar with Mesioangular Angulation

Triangular or envelope flap → bone covering the tooth is removed using a round bur, until the entire crown is exposed → bone guttering [remove bone from the buccal and distal aspects of the crown creating a groove] → **section the roots bucco lingually as far as the inter radicular bone using fissure bur** → section the roots using straight elevator → remove the **distal segment first** then the mesial segment [**If the tooth is single rooted (or fused roots) remove the mesial portion first then the remaining portion is luxated and removed**] → remove follicular sac → check for sharp bone edges and smoothen them → saline irrigation → suture

NOTE: The extraction of mandibular third molar with vertical angulation is similar to mesioangular impaction by sectioning and separation of the tooth vertically, then each one removed separately



Extraction of Mandibular Third Molar with Horizontal Angulation

Triangular or envelope flap → bone covering the tooth is removed using a round bur, until the entire crown is exposed → using a fissure bur section the crown from the root using a vertical cut at the cervical line of the root [the cut should not be deep because there is risk of injuring the IAN] → separate the pieces using a straight elevator → The crown is removed using straight elevator → then the root is removed using a straight or Cryer elevator [placed buccally] → remove follicular sac → check for sharp bone edges and smoothen them → saline irrigation → suture

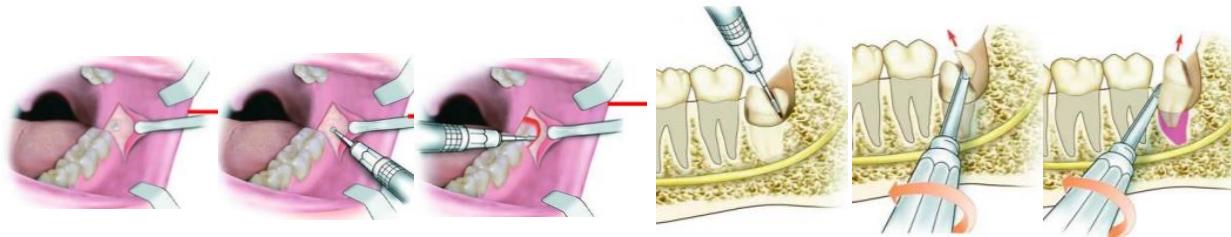
Note: If the tooth has two roots (not fused), after sectioning and removal of the crown, the roots should be separated, then they are easily removed one at a time, first the distal then the mesial root.





Extraction of Mandibular Third Molar with Distoangular Angulation

Triangular or envelope flap → bone covering the tooth is removed using a round bur, until the entire crown is exposed → bone guttering [remove bone from the buccal and distal aspects of the crown creating a groove] → section the distal portion of the crown using a fissure bur and remove it → the remaining segment of the tooth is then luxated and removed → remove follicular sac → check for sharp bone edges and smoothen them → saline irrigation → suture



Coronectomy (Intentional Root Retention)

Removing the crown but leaving the roots which have an intimate relationship with the inferior dental canal. To avoid injury to the inferior dental nerve



Guidelines :

It should not be done if the tooth is:

- 1- infected
- 2- mobile [because a mobile tooth will act as a mobile foreign body and become a nidus for infection or migration]
- 3- Has horizontal impaction [because sectioning of the tooth itself could endanger the nerve]

No need to perform RCT for the exposed pulp of the remaining root + The remaining root should be at least 3 mm inferior to the crest of the bone to allow bone formation over the root

Q: what is the indication for doing coronectomy ? if the tooth has intimate relation with the IDC , to avoid injury to the IAN you remove the crown only and keep the root – remaining root should be at least 3 mm below the alveolar bone crest [tooth must not be infected or mobile or have horizontal impaction]

Extraction of Impacted Maxillary Third Molar

More difficult than mandibular 3rd molars because :

- 1- limited access and visualization
- 2- Reduced mouth opening
- 3- Impacted tooth is close to maxillary sinus

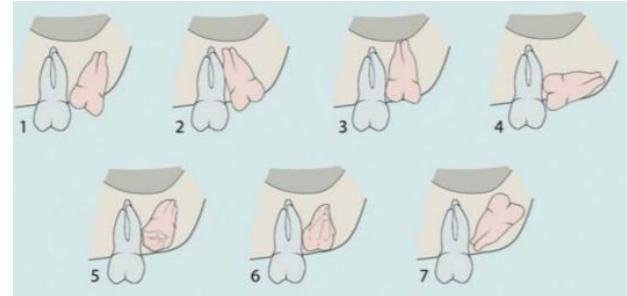
Erupted maxillary 3rd molars are easy to extract while impacted 3rd molars are difficult



NOTE: maxillary impacted 3rd molars are usually mesially or distally inclined , with the occlusal surface positioned **buccally**.

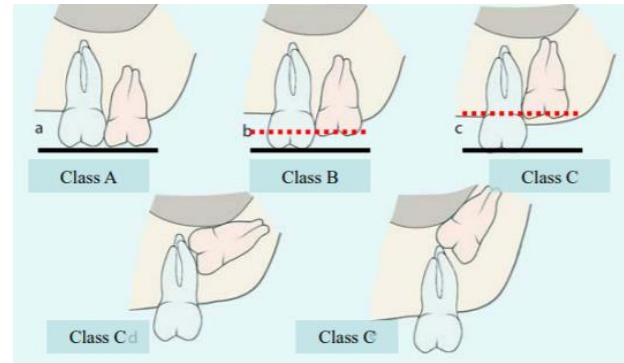
classification according to angulation:

- 1- Mesio angular
- 2- Distoangular
- 3- Vertical
- 4- Horizontal
- 5- Transverse [bucco angular]
- 6- Transverse [lingo angular]
- 7- Inverted



classification according to depth of impaction:

- **Class A** = The occlusal surface of the impacted tooth is at approximately the same level as the occlusal surface of the second molar.
- **Class B** = The occlusal surface of the impacted tooth is at the middle of the crown of the second molar.
- **Class C** = The occlusal surface of the crown of the impacted tooth is apical to the cervical line of the second molar or deeper, or even above its roots



Class C impaction is very difficult → there is risk of displacing the tooth into the max sinus + you need to remove a lot of bone

Anesthesia for extraction of upper third molar → Posterior superior alveolar nerve (infiltration). + Greater palatine nerve (block).

Flaps used in maxillary impacted teeth removal :

- **Triangular flap:** The incision begins at the maxillary tuberosity and extends to the distal aspect of the second molar, vertical incision continues obliquely upward to the vestibular fold.



If the **impaction is deep**, the vertical incision may be made at the **distal aspect of the first molar**.



- **Horizontal (envelope) flap:** The incision begins at the maxillary tuberosity and extends to the distal aspect of the second molar, continuing buccally along the cervical lines, and ending at the mesial aspect of the first molar.

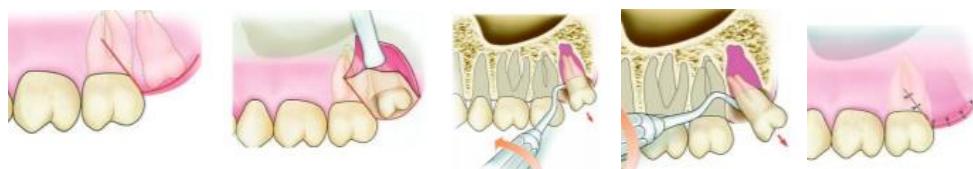


**Procedure:**

Triangular or envelope flap → buccal bone is removed until the entire crown of the impacted tooth is exposed → luxate the tooth out using a straight or angled elevator on the mesial aspect of the tooth → irrigate → suture

NOTE: The bone in this area is **thin**, it may be removed using a **sharp instrument (chisel)**. If the **bone is thick** → use a surgical bur

In removal of maxillary impacted teeth sectioning is not possible so you need to provide adequate space around the crown to be able to luxate the tooth .





Complications of extractions

- The most common complication of extraction → **PAIN**
- The main cause of pain in dental extractions → **failed LA**
- The main cause of failed LA → **in appropriate technique**

FAILURE TO REMOVE THE TOOTH AFTER MILD TO MODERATE FORCE INDICATES THE NEED FOR SURGICAL EXTRCATION

Causes of pain during extraction from most to least common:

- 1- Failed LA
- 2- Pt anxiety
- 3- Infection in the area
- 4- Supplementary innervation

Q: why do most cases of osteomyelitis / dry socket occur in the mandible ? because of dense bone + less blood supply

Dense bone :

- 1- Difficult extractions + difficult to obtain good LA
- 2- Less blood supply → more chance of dry socket and osteomylitis
- 3- Very good implant stability

COMPLICATION	CAUSE	MANAGEMENT
FRACTURE OF THE TOOTH	1- Tooth is weakened by caries/ large restoration or by RCT 2- Improper application of forceps [they were applied to the crown not the root mass or the long axis of the beaks was not along the long axis of the tooth] 3- Using excessive force	1- Remove all debris 2- Identify where the fractured segment went 3- remove remaining part of the tooth by conventional or surgical means
INJURY TO ADJACENT TOOTH / RESTORATION	Using excessive force during extraction specially if you use adjacent teeth as fulcrum during luxation	If the adjacent tooth had a large restoration that fractured → place TF If the adjacent tooth is luxated or partially avulsed : <ol style="list-style-type: none"> 1- Reposition tooth in the socket 2- Fix the tooth using splint 3- Check occlusion and take the tooth off of occlusion if needed 4- Instruct the pt to have soft diet only ** if the tooth is still TTP after healing → RCT



COMPLICATION	CAUSE	MANAGEMENT
FRACTURE OF THE ROOT	<ul style="list-style-type: none"> 1- long , curved, thin divergent roots 2- RCT 3- Bulbous or ankylosed root 	<p>You can leave the root tip if:</p> <ul style="list-style-type: none"> 1- It is asymptomatic and not associated with any pathology 2- Located deep in the socket 3- Small [3-4 mm] 4- Old patient 5- Risk of serious local complications like dislodgment into the maxillary sinus or damage to the IAN 6- If removal will require removing a lot of bone 7- Pt has serious health condition [ex: taking bisphosphonates] <p>You have to remove the root tip if :</p> <ul style="list-style-type: none"> 1- Mobile 2- Infected 3- Large size <p>** apical root fractures of deciduous roots → leave them , they will be pushed out by the eruption of the perm tooth [attempting to remove them by elevators can damage the perm tooth bud]</p>
EXTRACTION OF THE WRONG TOOTH	<ul style="list-style-type: none"> 1- Mis diagnosis 4- Miscommunication with other doctors 	<p>In case of mis diagnosis you can't do anything the pt will return after few days with pain because you extracted the wrong tooth</p> <p>In case of miscommunication [usually with orthodontist]:</p> <p>Contact the orthodontist and see if they can modify the tx plan</p> <p>If they cannot change the tx plan → inform the pt + reimplant the tooth + splint</p>
DISPLACEMENT OF THE ROOT TIP	<p>Lingual plate is eroded by infection</p> <p>Lower molars :</p> <p>If the root is above mylohyoid muscle → sublingual space</p> <p>If the roots are below mylohyoid muscle → submandibular space</p> <p>Lower 3rd molars → pterygo mand space</p> <p>Upper molars → maxillary sinus</p> <p>[mostly the palatal root of the maxillary first molar]</p> <p>2- Upper 3rd molar → infratemporal fossa [behind max tuberosity]</p>	<p>Localize the displaced tooth / root [take an xray in case of displacement into the max sinus]</p> <p>Removal by surgical approach:</p> <p>If the tooth is displaced between the max sinus and the alveolar bone → reflect a flap then you can retrieve it by suction or by tweezers or by wrapping it with gauze then pulling the gauze out</p> <p>If the tooth is displaced into the maxillary sinus → cadwell Luc approach</p>

Maxillary sinus reaches its normal size by the age of 18 - Normal distance between apices of molars and max sinus = 1 -1.5 cm



Caldwell-luc approach indications:

- 1- Removing a foreign body from the sinus cavity proper; displaced tooth or root.
- 2- Excision of sinus polyps, tumors and cysts.
- 3- Treatment of blow out orbital fracture.
- 4- Grafting of maxillary sinus.

Gaining access to the maxillary sinus proper [for whatever reason] is always through cadwell luc approach

Procedure: reflect a flap → open a window of bone in the area of interest → expose the sinus → remove the tooth → place the bone window back to place → suture the flap

Oro antral communication [OAC] ***

- If untreated leads to oro antral fistula [the communication will epithelialize and become chronic]
- OAF is not common below the age of 15 [there is enough distance between the sinus and the teeth]

Risk factors of OAC :

- 1- Maxillary molar roots close to the maxillary sinus
- 2- Pneumatization of maxillary sinus
- 3- Divergent, hypercementosed roots
- 4- Root displaced into max sinus

Causes of OAC:

- 1- Displacement of tooth / root tip into the maxillary sinus.
- 2- the alveolus is debrided unnecessarily (over scaling or curettage)
- 3- The presence of a periapical lesion that has eroded the bony wall of the maxillary sinus floor.
- 4- Fracture of the maxillary tuberosity [part of the sinus gets included with the maxillary tuberosity]
- 5- Extensive bone removal for extraction of an upper posterior impacted tooth or root.

Q: What is the first thing to check after fracture of maxillary tuberosity? Check for OAC

Q: how do you confirm an OAC?

Do **nose blowing test** [occludes the patient's nose → ask pt to blow gently through the nose while you observe the area of the tooth extraction. If a communication exists, **there will be passage of air through the tooth socket + bubbling of blood in the socket area**

Other methods of checking for OAC:

- A. when the patient rinses his mouth, water seeps through the nose
- B. Change in speech tone and resonance
- C. After extraction you find a piece of bone attached to the root ends → indicates OAC
- D. During debridement of the tooth socket, the periapical curette enters to a greater depth into the socket.





E. Radiograph clearly shows discontinuity of the max sinus floor

Prevention of OAC:

- 1- Careful radiograph evaluation before extraction [if sinus floor is close to roots → do surgical exo]
- 2- Careful manipulations with instruments [don't apply forceps unless there is sufficient tooth structure]
- 3- Careful debridement of periapical lesions that are close to the maxillary sinus - Avoid luxation of the root tip if visualization of the area is hindered by hemorrhage + leave the apical 3rd of the root if it gets fractured [must not be mobile and not infected]
- 4- During surgical removal of an impacted upper third molar, exposure of the impacted tooth must be adequate so that the forces exerted during luxation are controlled

Management of OAC:

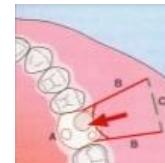
- Small OAC [less than 0.5 cm] → leave it [it will close by blood clot] + instruct pt to avoid any +ve/ -ve pressure [avoid using straws, blowing balloons, using mouthwash]
- Large OAC [more than 0.5 cm] → buccal advancement flap or Bridge pedicle flap or palatal transposition flap + **surgical splint can be used to support the flap**
Bridge or palatal transposition flap are done in case you cannot do a buccal advancement flap [there is an abscess , fistula etc ..]

The OAC has to be closed to prevent micro organisms from entering into the maxillary sinus and causing an infection.

Q: best and most common flap to close OAC ? buccal advancement flap

Flaps to close OAC :

- 1- **buccal advancement flap** : [most commonly used – easiest + least complications] you cut the mucosa + the cheek to create a flap and cover the defect – the flap is sutured using horizontal mattress suture



if the flap doesn't extend to cover the OAC → cut the periosteum with a blade to gain flexibility and lower the socket wall with a bur

- 2- **bridge pedicle flap** : flap is cut from the ridge and then reversed to cover the OAC



- 3- **palatal transposition flap** : provides **BEST STRENGTH** and **BEST RESULTS** but it is very difficult to manipulate [the raw area is left to heal by 2° intention which might be troublesome for the pt since they will always touch it with their mouth]





post op medications for OAC:

- ABX [penicillin]
- Analgesics [paracetamol / ibuprofen]
- Nasal decongestant [ephedrine or otrivin nasal drops]
- Steam inhalation

Be careful when extracting isolated max molars because mostly there will be max sinus pneumatization and high risk of OAC

Chronic OAF [oro antral fistula] or persistant OAC :

Causes:

1. Unrecognized (overlooked) fistula or Untreated fistula.
2. Failure of spontaneous closure of OAF.
3. Failure of surgically repaired fistula

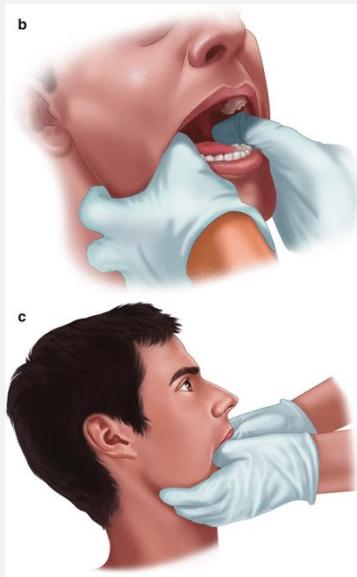
Signs and symptoms of chronic OAF:
Reflux of food and drinks. - Loss of denture stability - Intermittent pain and local tenderness - Foul-tasting discharge - chronic sinusitis.



COMPLICATION	CAUSE	MANAGEMENT
LOSS OF TOOTH / ROOT	<ol style="list-style-type: none">1- It could be hidden somewhere in the mouth (ex: under the tongue, buccal vestibule) or under mucoperiosteal flap.2- It could be in the spittoon or suction.3- Swallowed and stuck in the alimentary tract or lungs.	<ol style="list-style-type: none">1- Turn the pt to mouth-down position and encourage to cough and spit the tooth out onto the floor. **If the patient has no coughing or respiratory distress, it is most likely that the pt swallowed the tooth [it will pass through in 1-2 days] **If the patient has a violent episode of coughing that continues, the tooth may have been aspirated beyond the larynx into the trachea [tooth goes to the right bronchus because it is larger and more vertical]2- Transport pt to an emergency room to take chest and abdominal radiographs and locate the tooth<ul style="list-style-type: none">• If the fractured piece is adherent to the tooth (comes out with the tooth), nothing can be done.• If the fractured alveolar plate is not attached to the tooth (still inside the socket) but has little periosteal attachment → remove and smoothen sharp edges• If it is still adequately attached to the periosteum → horizontal mattress or simple interrupted suture to stabilize the plate and allow its incorporation into the healing process.
FRCTURE OF ALEVEOLAR PROCESS	<ol style="list-style-type: none">1- Use of excessive extraction forces2- Abrupt movements3- Tooth is ankylosed	
FRCATURE OF MAXILLARY TUBEROSITY	<ol style="list-style-type: none">1- Weakening of the tuberosity, due to the maxillary sinus pneumatizing2- Fusion of the unerupted third molar to the root of the second molar.3- Ankylosis of a maxillary molar	<ol style="list-style-type: none">A. fractured segment is not detached from the periosteum → reposition + splint the tooth being extracted to adjacent teeth and defer the extraction for 6 to 8 weeks [then do surgical extraction]B. bone segment is completely detached from the tissues + there is OAC → the tooth is removed + the bone is smoothed and the wound is tightly sutured + prescribe broad spectrum antibiotics and nasal decongestants



COMPLICATION	CAUSE	MANAGEMENT
FRACTURE OF THE MANDIBLE	<p>** mostly with extractions of mandibular 3rd molars</p> <p>1- The use of excessive force 2- Deeply impacted / ankylosed tooth 3- The mandible is atrophic (weak) 4- Presence of large pathologic lesions in the area of the tooth to be extracted.</p>	Inter maxillary fixation [IMF] or Open reduction rigid fixation [ORIF]
SOFT TISSUE INJURY	<p>1- Improper use of instruments [slippage of the elevators / forceps]</p> <p>2- Injury at the corner of the mouth is due to excessive retraction force by forceps or elevator</p> <p>3- Burns on the lower lip due to contact with an over heated surgical handpiece</p>	<p>Prevention:</p> <p>1- Avoid excessive retraction 2- Coat lips with vaseline 3- Avoid touching the lips with the hot hand piece</p>
TMJ DISLOCATION	<p>1- Long procedure where the pt is opening wide</p> <p>2-application of too much force to an unsupported mandible</p>	<p>Clinical presentation: unilateral dislocation = mandible deviates towards the healthy side bilateral dislocation = the mandible slides forward in a prognathic position [most cases] open bite [pt is unable to close their mouth]</p> <p>Management: Immediately after the dislocation, the thumbs are placed on the occlusal surfaces of the lower teeth, while the rest of the fingers surround the body of the mandible right and left. Pressure is then exerted downward → backward & upwards → condyle is replaced in its original position. Wrap your fingers with gauze because when the condyle is reduced back to it's position the pt can close down forcefully on your fingers You can also place your fingers on the external oblique ridge and not the occlusal surface After repositioning, the patient must avoid any excessive opening of the mouth for a few days. <i>If this is not done immediately, muscle spasm of the mandible will occur and the patient will require sedation, or even a general anesthetic, to reduce the dislocation</i></p>





Q: pt comes a few days after extraction with a lip ulcer , what is the DD?

- 1- Self inflicted injury from LA
- 2- Trauma from hand instruments [excessive retraction or slippage on a sharp instrument]
- 3- Trauma from hot hand piece



Q: pt come sin after 2 hours post extraction with class III + drooling ? TMJ dislocation [bilateral]

COMPLICATION	CAUSE	MANAGEMENT
HEMORRHAGE	<ol style="list-style-type: none"> 1- Systemic problem like haemophilia 2- Pt did not follow post op instructions 3- Inadequate removal of inflammatory tissue 4- infection 	<p>First management of any bleeding is applying pressure</p> <p>Other methods :</p> <ul style="list-style-type: none"> • local hemostatic agents [gelatin sponge, oxidized cellulose] • laser / electro cauterity • suturing • ligation <p>Blood oozing is normal in the first 24 hours after exo.</p> <p>Anything after that [secondary bleeding up to 14 days post exo] is caused by infection that dislodged the blood clot</p> <p>In case the bleeding is from a damaged inferior alveolar artery → just apply pressure because you cannot ligate it</p>
SURGICAL EMPHYSEMA	<p>Facial swelling cause by collection of air that is forced into the tissue when using an air producing hand piece or air spray</p>	<p>Clinical sign : facial swelling + painful crackling on palpation</p> <p>NO TX NEEDED - subsides spontaneously after 2-4 days</p> <p>Some suggest giving ABX + antihistamines</p>

Q: what's the difference between open and blind ligation?

- Open ligation you can locate the cut blood vessel and hold both ends to suture it.
- Blind ligation you don't know which exact blood vessel is causing the bleeding → place random suture in the area of bleeding

Q: what should you do if a pt comes after 24 hours of extraction with bleeding that does not stop with any local measure ? the pt mostly has a systemic problem send , send the pt to test their bleeding time and INR

Q: can you do an extraction for a pt on warfarin / aspirin? Yes, but their INR should be below 3.5

Most common nerve injury is to inferior alveolar, mental and lingual nerves

If the permanent tooth bud is extracted with the primary tooth → reposition the tooth in the socket

**Severe post extraction pain might be due to:**

- 1- Incomplete extraction of the tooth / wrong diagnosis
- 2- Laceration of the soft tissues.
- 3- Exposed bone. [most common]
- 4- Infected sockets.
- 5- Damage to adjacent teeth

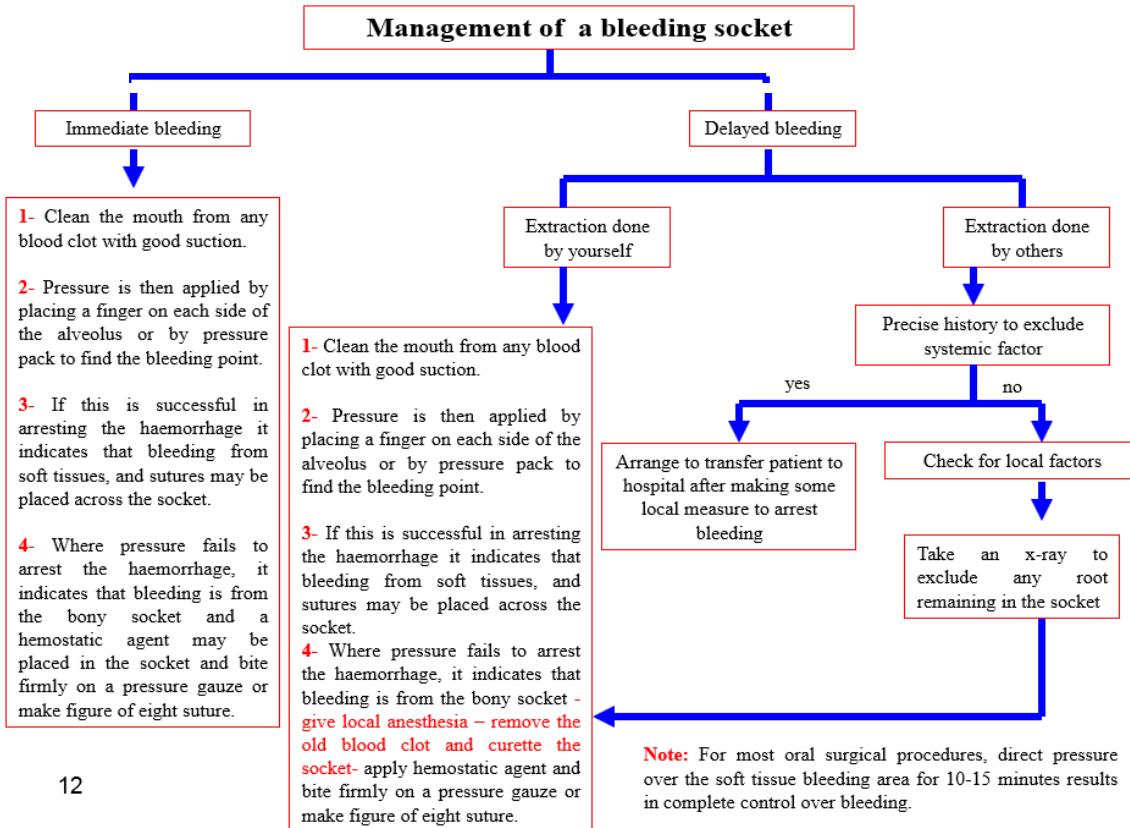
COMPLICATION	CAUSE	MANAGEMENT
TRISMUS	<p>Restricted mouth opening [mostly with lower 8 extractions] Normal mouth opening = 45-50 mm [trismus is anything below 30 mm]</p> <p>1- Spasm of the masticatory muscles (mainly medial pterygoid) due to injury caused by a repeated needle injections during inferior alveolar nerve block. 2- Swelling 3- Buccal or masseter space infection</p> 	<ul style="list-style-type: none"> • If due to inflammation → hot mouth rinses + hot compresses for 20 min every hour until symptoms subside (this should be <u>started after 24 hrs not the day of operation</u>) <p><i>As a prevention the patient should place COLD PACKS in the first 24 hours after surgery to limit edema by vasoconstriction</i></p> <ul style="list-style-type: none"> • Administration of analgesics, anti-inflammatory and muscle relaxant medication. • Physiotherapy: opening and closing the mouth, as well as lateral movements, to increase the extent of mouth opening (lasting 3–5 min every 3–4 h).
ECCHYMOSIS	<p>Blood oozing in the submucosal / subcutaneous tissue causing hematoma</p> <p>Might be cause by flap retraction</p> 	<ul style="list-style-type: none"> • Onset is 2-3 days after surgery • No TX needed - resolves in 7-10 days
EDEMA	<p>Extensive surgery</p> <p>Edema in more in the morning due to postural changes</p>	<ul style="list-style-type: none"> • Swelling reaches the maximum after 48-72 hours and begins to subside in the 3rd or 4th day • Increased swelling after 3rd day indicates infection <p>Small edema → no tx needed If edema is due to infection → manage the infection</p>



ALVEOLAR OSTITIS [DRY SOCKET]	<p>Blood clot does not form in the socket after exo or it gets dislodged</p> <p>Predisposing factors:</p> <ul style="list-style-type: none"> 1- Traumatic extractions 2- Pt did not follow instructions [excessive mouth rinsing dislodges the blood clot] 3- Smoking 4- Oral contraceptives 5- Poor oral hygiene / active infection like pericoronitis <p>signs / symptoms:</p> <ul style="list-style-type: none"> 1- Severe radiating pain 2- the tooth socket appears empty, with a partially or completely lost blood clot+ exposed bone [very sensitive to touch] 3- bad odor+ bad taste. 4- surrounding gingiva is swollen and inflamed. 5- Enlarged lymph nodes in the neck 	<p>Prevention: place COLD PACKS for 10- 15 mins every 4-6 hours after surgery in the first day</p> <ul style="list-style-type: none"> • Pain starts to increase 3-4 days after extraction and lasts for 7- 10 days • Self limiting condition + healing of the socket will occur even without tx but it will happen slowly <p>Management:</p> <p>Is to reduce pain during healing [if no tx is provided the only thing that will happen is the pt will continue to have pain]</p> <ul style="list-style-type: none"> 1- Irrigate socket with saline 2- DO NOT CURETTE THE SOCKET [this will increase exposed bone and pain] 3- Apply iodoform gauze inside the socket [contains eugenol that reduces pain] 4- Dressing is changed every day or every other day for 5 to 6 days until pain decreases [in each dressing change irrigate the socket] – once pain decreases → discontinue the dressing because it will slow down the healing 5- Ask the pt to use hot saline mouthrinses 6- Give paracetamol / ibuprofen for pain 7- Systemic involvement or immunocompromised pt → ABX [metronidazole 200-400 mg 3 times daily for 5 days]
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- Pain after exo up to 3 days = normal
- Pain increases after 3 days → dry socket







Odontogenic infections

Most odontogenic infections occur as periapical abscess

Inflammatory rxn = a protective rxn to limit the spread of the irritant

Inflammation cardinal signs:

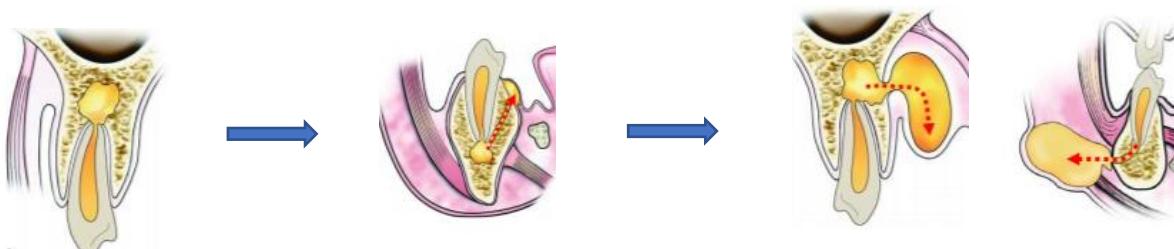
- 1- **Swelling**- due to increase in BVs permeability
 - 2- **Heat** – due to hyperemia
 - 3- **Pain**- due to mediators and swelling
 - 4- **Loss of function**- due to pain and swelling
 - 5- **Redness** – due to vasodilation
- Any infection is an inflammation but not each inflammation is an infection
 - 50% of infections are caused by mixed anaerobic and aerobic bacteria

Spread of infection by :

- 1- Blood vessels
- 2- Lymphatic vessels
- 3- Continuity through tissue spaces [most common]

Factors that determine the spread of infection:

- A. Thickness of bone overlying the apex
- B. Muscle attachments



Pus starts to accumulate inside the cancellous bone causing [intra alveolar abscess or periapical abscess] → Then pus perforates the cortical plate, and accumulates between the bone and periosteum [subperiosteal abscess] → pus perforates the periosteum, and spreads through the soft tissues.

- IO = underneath the mucosa [submucosal abscess (vestibular abscess)]
- EO = towards the facial spaces [fascial space abscess]

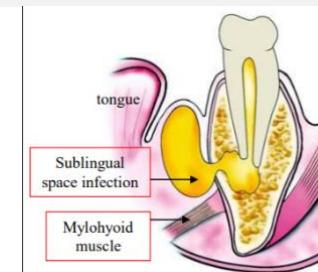
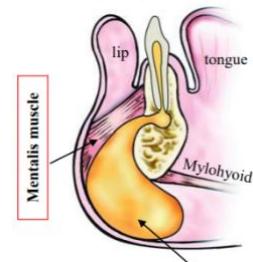
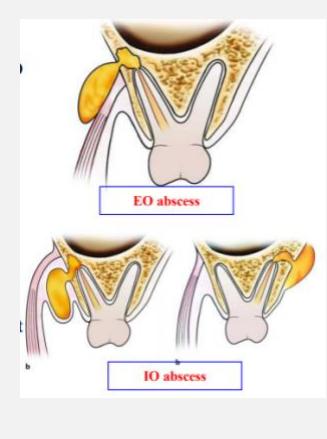
If the patient does not seek treatment → swelling will rupture spontaneously (either IO or EO) with the formation of a sinus tract [The infection will recur if the site of spontaneous drainage closes]

As long as the sinus tract continues to drain, the patient will have no pain.

ABX will stop the drainage, but when antibiotics are stopped, the infection will recur.



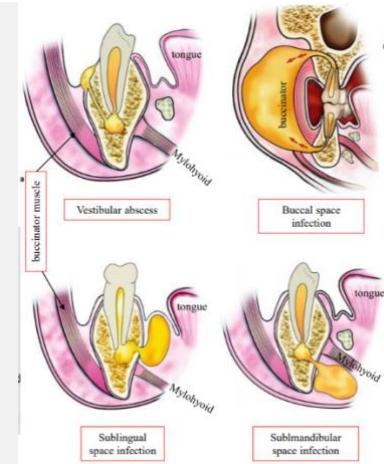
TOOTH	SPREAD OF INFECTION
UPPER CENTRAL	IO – labial vestibule
UPPER LATERAL	IO- labially or palatally (depending on root curve)
CANINE	IO / EO (depending on root length and muscle attachment) IO – labial vestibule EO- infraorbital space
UPPER PM	IO- buccal vestibule
UPPER MOLARS – 3 RD MOLAR	<p>IO-</p> <ul style="list-style-type: none"> • buccally (vestibular abscess) [root is below buccinator] • palatally (from palatal root) <p>EO-buccal space [root is above buccinator]</p> <p>3rd molars – like upper molars + spread to infratemporal fossa</p>
LOWER INCISORS	IO – labial vestibule [root is above mentalis] EO- submental space [root is below mentalis]
CANINE	IO- vestibular abscess
PM	IO- buccally or lingually (apex above mylohyoid muscle → sublingual space)





MOLARS

IO- buccal : buccal vestibule
IO- lingual : sublingual space
EO-buccal : buccal space
EO- lingual : submandibular space



Q: Patient with infection/ swelling how do you manage? [principles of treating odontogenic infections]

1. Determine severity of infection
2. Evaluate pt host defense
3. Determine the need to refer the pt to a specialist
4. Treat the infection surgically (I & D) if needed
5. Support pt medically
6. Prescribe appropriate ABX
7. Evaluate the pt frequently



MANAGEMENT PRINCIPLE	WHAT HAS TO BE DONE
DETERMINE SEVERITY OF INFECTION	<p>A. History (ask about pain, swelling ,trismus and any difficulty breathing or swallowing)</p> <p>B. Examination:</p> <ul style="list-style-type: none"> - Vital signs [blood pressure , temp, respiration] + pt's general appearance - Check for dysfunction - ask pt to open their mouth widely, swallow, and take deep breaths. [to check for trismus, breathing or swallowing difficulties] - Palpate the swelling [tenderness, heat , and character of the swelling] - determine stage of swelling [inoculation , cellulitis, abscess stage] - IO examination [look for any source of infection , vestibular abscess or draining sinus] <p>C. Radiographs [OPG & intraoral radiographs]</p>
EVALUATE PT'S HOST DEFENSE	Check if the pt is immunocompromised [diabetic, taking immunosuppressive medications etc]
DETERMINE THE NEED TO REFER THE PT TO A SPECIALIST	<p>Criteria to refer the pt to a specialist:</p> <ol style="list-style-type: none"> 1- Rapidly progressive infection 2- Difficulty in breathing / swallowing / severe trismus 3- Deep fascial space involvement 4- Elevated temperature (more than 38.5 C) 5- Toxic appearance: glazed eyes, open mouth, and a dehydrated, sick appearance. 6- Compromised host defenses
TREAT THE INFECTION SURGICALLY	<p>The aim is to remove the source of infection + drain puss</p> <p>If the source of infection is a carious tooth , Tx options are :</p> <ol style="list-style-type: none"> 1- RCT if the tooth is restorable 2- Extraction if the tooth is not restorable 3- I & D [can be used whenever RCT or exo are not enough alone]
SUPPORT THE PT MEDICALLY	Maintain hydration [drink a lot of water or juice to compensate for deficiency in food intake due to pain and swelling] + analgesics for pain relief
PRESCRIBE APPROPRIATE ABX	<p>Situations that need ABX :</p> <ol style="list-style-type: none"> 1- rapidly progressing infection with diffuse swelling (cellulitis) 2- compromised host defense 3- Infections that spread to deep fascial spaces. 4- Patient with severe pericoronitis, with fever, trismus, and swelling of the face. 5- Patient with osteomyelitis requires antibiotic therapy in addition to surgical therapy. <p>ABX that can be used: Penicillin , Amoxicillin , Clindamycin , Azithromycin ,Metronidazole , Moxifloxacin</p> <p>Situations that don't need ABX:</p> <ol style="list-style-type: none"> 1- Mild pericoronitis [gingival edema + mild pain] 2- Multiple extractions in a healthy pt 3- Dry socket *** 4- Pt demand/ severe pain or very small abscess that can be treated by extraction or endo
EVALUATE THE PT FREQUENTLY	Patient should be seen after 2 days to evaluate signs and symptoms + check the I&D site to determine whether the drain should be removed.



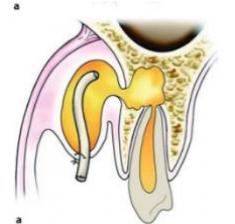
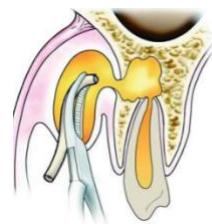
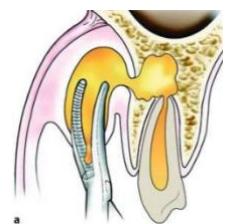
Q: why is it important to do I & D?

- 1- Decrease the load of bacteria
- 2- Reduction in tissue tension
- 3- improve the local blood supply
- 4- increase the delivery of host defenses to the area
- 5- if you give ABX alone the infection will not resolve

Edema	Does not respond to I & D , you can only do RCT or exo
Cellulitis	There is no puss but I & D will stop the spread of infection
Abscess	I & D

Hilton's principles of incision and drainage:

- 1- Clean the area with an **antiseptic solution before the incision**.
- 2- Plan the site of the incision:
 - A. preferred site is **directly over the site of maximum swelling and inflammation**.
 - B. Injury to vital structures like ducts, blood vessels and nerves should be avoided
 - C. For esthetic reason, the **EO incision should be made in a hidden area**.
- 3- **Nerve block anesthesia** is preferred or **superficial infiltration of LA solution into and around the area to be drained**
Once the needle used in an infected site it should not be reused in an uninfected area.
- 4- Incision is made **with blade no.11** through the mucosa or the skin and into the abscess cavity.
The incision should be **short [no more than 1 cm in length]**
- 5-
- 6- A **closed curved hemostat** is inserted into the abscess cavity, then **opened in several directions to break up any small loculations or cavities of pus** then **withdrawn to the outside with open beaks** [to make sure it is not grabbing any nerves or vital tructures]
- 7- Place a **rubber drain inside the cavity** + stabilize it with a suture to keep the incision open for continuous drainage





The most frequently used drain is **penrose drain**, you can also use a small strip of **sterilized rubber dam or surgical gloves**

- 8- The drain should remain in place until all the drainage from the abscess cavity has stopped, usually 2 to 5 days. Removal is done by cutting the suture and slipping the drain from the wound.



Q: when are drains removed after I& D of an abscess? When the drainage stops usually 2-5 days after surgery

Q: Should patient apply hot compressors , why? NO, because it will cause spontaneous drainage and evacuation towards the skin

Q: in cases of abscess what procedure can you do to ensure that you are prescribing the correct ABX?

Before I&D you can take a specimen from the puss through a needle and send it for culture and sensitivity testing

Q: what are the things you need to consider before prescribing ABX?

- 1- Seriousness of the infection [rapidly spreading infection requires ABX]
- 2- Feasibility of doing surgical tx [sometimes extraction alone will resolve the issue]
- 3- Pt's host defense [immunocompromised pts need ABX]

Q: mention some reasons of tx failure?

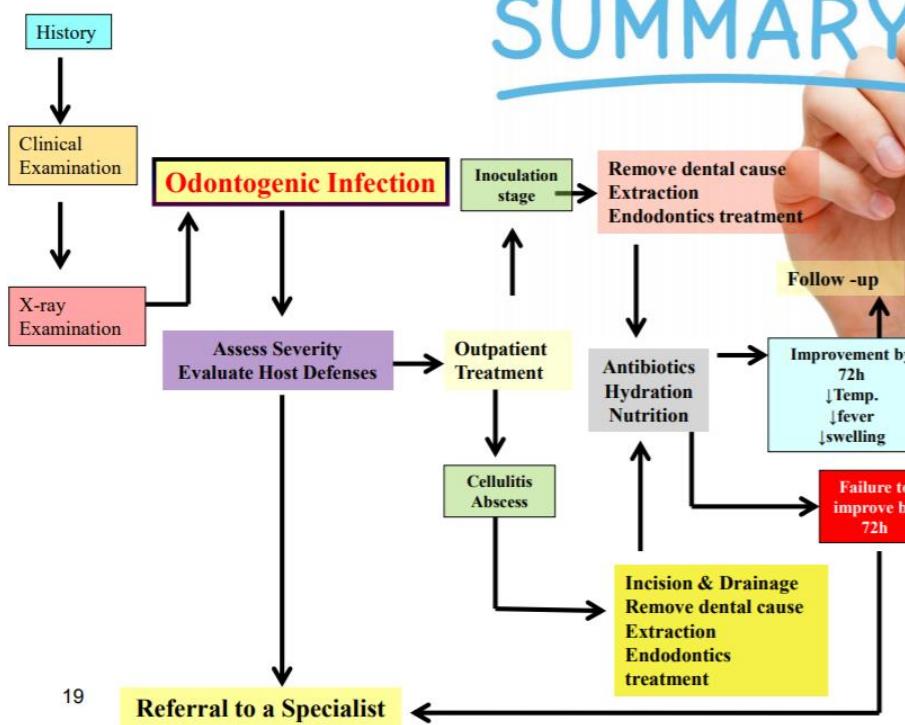
- A. Inadequate surgery.
- B. Depressed host defenses.
- C. Foreign body.
- D. Antibiotic problems. [Patient noncompliance, Drug not reaching site, Drug dose too low, Wrong bacterial diagnosis ,Wrong antibiotic]

Characteristic	Edema (Inoculation)	Cellulitis	Abscess
Duration	0–3 days	1–5 days	4–10 days
Pain, borders	Mild, diffuse	Diffuse	Localized
Size	Variable	Large	Smaller
Color	Normal	Red	Shiny center
Consistency	Jelly-like	Boardlike	Soft center
Progression	Increasing	Increasing	Decreasing
Pus	Absent	Absent	Present
Bacteria	Aerobic	Mixed	Anaerobic
Seriousness	Low	Greater	Less





SUMMARY



19



Deep facial tissue involvement in odontogenic infections

Facial spaces = potential spaces that do not exit unless there is untreated spread of infection

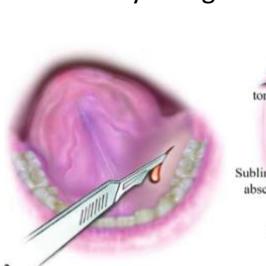
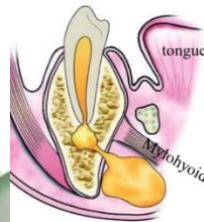
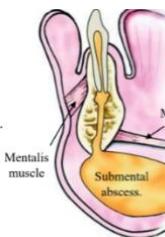
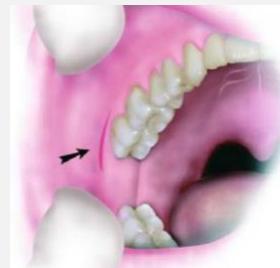
Primary facial spaces	Secondary facial spaces
Involved directly	Involved if the pt does not receive tx
Maxillary primary spaces :	
Canine space	Masseteric
Buccal space	Pharyngeal
Infratemporal space	Pterygomandibular
	Temporal
Mandibular primary spaces :	
Buccal space	
Submandibular space	
Sublingual space	
Submental space	

	SPACE	CAUSE OF INVOLVEMENT	MANAGEMENT
MAXILLARY PRIMARY SPACES	Canine	infection from the maxillary canine tooth, when the root is <u>superior to the origin of the levator anguli oris muscle</u> and <u>below the origin of the levator labii superioris muscle</u> .	Spontaneous drainage may occur just inferior to the medial canthus of the eye incision for drainage is performed intraorally at the mucobuccal fold, in the canine region 
	Buccal	infection from either the maxillary or mandibular posterior teeth when infection erodes through the bone superior (maxilla) or inferior (mandible) to the attachment of the buccinator muscle .	If neglected, may result in spontaneous drainage Incision can be IO or EO IO : To avoid injuring the facial nerve & vessels + For esthetic reasons. Horizontal incision is made through the mucosa of the cheek in the premolar – molar region (avoid injury of the parotid duct). EO : when intraoral access will not ensure adequate drainage. The incision is made approximately 2 cm



MANDIBULAR PRIMARY SPACES

Infratemporal	infection of the upper third molar or LA injection with contaminated needle in the area of the tuberosity.	below and parallel to the inferior border of the mandible. Incision can be IO/ EO IO: In the buccal vestibule, between upper third molar and the coronoid process. EO: In severe trismus - in the scalp along the hair line, above zygomatic arch.
Submental	infections from the lower incisors when roots are apical to the attachment of the mentalis muscle . OR spread of infection from other anatomic spaces (submandibular).	EO incision only - beneath and parallel to the inferior border of the chin
Submandibular	infections from the lower molars when the root are apical to the attachment of the mylohyoid muscle . OR spread of infection from the sublingual or submental spaces	EO incision only - 2 cm below and parallel to the inferior border of the mandible
Sublingual	Infection from mandibular teeth when the root is above the attachment of the mylohyoid muscle (commonly premolars and first molar) . OR spread to this space from other adjacent spaces (submandibular, pharyngeal).	IO laterally along Wharton's duct

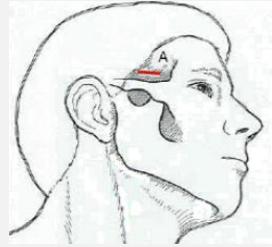
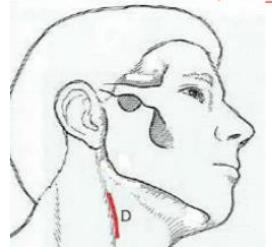




Q: what are the contents of the infratemporal fossa? mandibular nerve branches, chorda tympani nerve, maxillary artery, pterygoid venous plexus and pterygoid muscles

Q: what are the contents of the sublingual space ? Submandibular duct (Wharton ' s duct), the sublingual gland, lingual nerve, lingual artery, and part of the submandibular gland

Q: what are the communications of pterygomandibular space ? infratemporal, sublingual, submandibular and lateral pharyngeal spaces

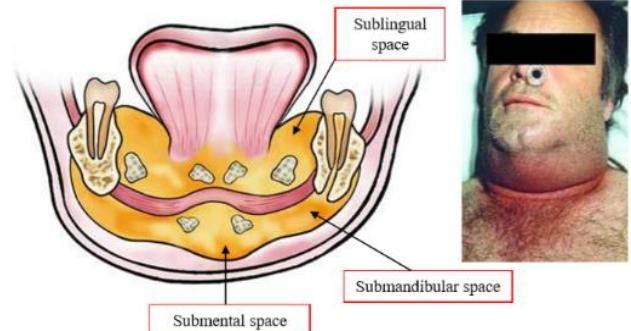
SPACE	CAUSE OF INVOLVEMENT	MANAGEMENT
MASSETERIC	infection spread from the buccal space or from infection around the mandibular third molar (pericoronitis)	IO incision that begins at the coronoid process and runs along the anterior border of the ramus . EO beneath the angle of the mandible
PTEYRGOMANDIBULAR SPACE	infection from mandibular third molars OR infection from IDN block OR from the sublingual and submandibular space infections	IO incision on the mucosa over the coronoid process. 
TEMPORAL	infection from the infratemporal space	EO in the scalp along hair line above the zygomatic arch 
LATERAL PHARYNGEAL SPACE	infection from other spaces (submandibular and pterygomandibular spaces). Retropharyngeal = due to spread of infection of lateral pharyngeal space [same management as lateral pharyngeal]	EO along the anterior border of sternomastoid muscle. <i>Drainage may be performed intraorally, but it is difficult and risky, because there is a great chance of aspiration of pus, especially if the procedure is carried out under general anesthesia</i> 



Severe complications of odontogenic infections

Ludwig's Angina:

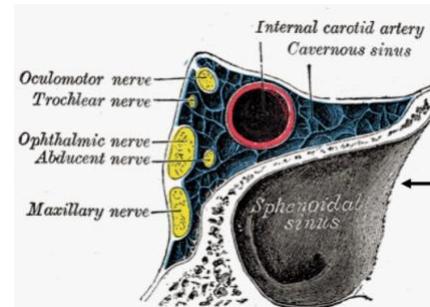
- Caused by **infection of the lower anterior teeth specially if the apex is below the mylohyoid muscle.**
- bilateral involvement of the **submandibular, sublingual and submental space.**
- **Clinically:**
severe difficulty breathing, swallowing, speaking
fever
elevated tongue
- **Tx:**
 - A. Airway maintenance [tracheostomy]
 - B. drainage of all the spaces and administration of a **double regimen of antibiotics.**
 - C. Incisions are both EO and IO
EO = bilateral – parallel and medial to the inferior border of the mandible, at the premolar and molar region
IO = parallel to the ducts of the submandibular glands



Cavernous sinus thrombosis [CST]:

Q: what causes CST? spread of infection from the paranasal sinuses, middle third of the face, odontogenic infections and tonsil infections.

Bacteria may travel from the maxilla posteriorly via the **pterygoid venous plexus** or anteriorly via the **angular vein and inferior or superior ophthalmic veins** to the cavernous sinus .



Signs and symptoms:

Headache - Photophobia - Periorbital edema - Proptosis - Ptosis - Chemosis - Ophthalmoplegia - Periorbital sensory loss - Fever



Q: what do those signs indicate: chemosis, ptosis, proptosis, periorbital edema ? Cavernous sinus thrombosis

Q: What vital structures are in the cavernous sinus?

- Periphery: CN3, CN4, ophthalmic and maxillary division of trigeminal nerve
- Center: ICA, CN 6



TX: treat the source of infection + broad spectrum ABX + prevent the spread to dural sinuses to prevent meningitis and brain abscess

Necrotizing fasciitis:

Cause: spread of infection through investing layer of deep cervical fascia, just deep to platysma muscle → necrosis of the muscle, subcutaneous tissue and skin because of the thrombosis and occlusion of the arterioles that pass through the platysma to provide blood supply to overlying tissue.

Early stage → dusky purple discoloration of the overlying skin due to ischemia is seen followed by frank necrosis.



Q: Which bacteria causes necrotizing fasciitis? Group A streptococci

Management: Surgery to debride skin + broad spectrum ABX + correct fluid and electrolyte imbalance

Pericoronitis:

Infection of the soft tissue overlaying a partially erupted molar due to injury from occlusion from the opposing tooth or entrapment of food under the operculum → bacterial invasion and infection

Once inflammation occurs, it remains permanent and causes acute episodes from time to time.

A characteristic feature is that when **pressure is applied to the operculum, pain and discharge of pus.**



Acute

Severe throbbing pain

Pus can be expressed from beneath the operculum by gentle pressure.

Bad taste

Indentation from the cusp of the opposing third molar.

Trismus

Submandibular lymph nodes enlarged and tender

Facial swelling

Fever

Anorexia

Chronic

Asymptomatic

Mild discomfort

Bad taste due to puss discharge

Management:

- Clinical + radiographical examination to determine if the tooth will achieve full eruption or not
- If there is abscess → I&D - No abscess → irrigate under the operculum with saline / mouthwash
- If the opposing tooth is aggravating the condition → extract or grind the cusp
Operculectomy [if the tooth is functional or strategic] OR Extract the tooth
- ABX - Amoxycillin 500 mg + metronidazole 400 mg, three times daily [for acute and subacute only]



Surgical extraction of the tooth (bone surgery) is contraindicated in the presence of an abscess since this will lead to osteomyelitis, but if the extraction could be achieved by conventional means, it should be removed as soon as possible.



Surgical management of benign soft tissue lesions

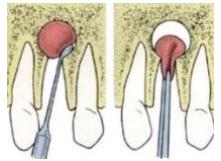
- Mild dysplasia → no tx [monitor + F/U]
- Moderate to severe dysplasia → surgical excision with safe margins
- Carcinoma in situ → deal with it as cancer with proper grading and staging
- Fibroepithelial polyp → surgical excision with its base [if it is small and not bothering the pt → leave it]
- Pyogenic granuloma → remove the irritating factor
- Pregnancy epulides → reinforce OH + scaling [the lesion will resolve after delivery]
If it doesn't disappear after delivery or during pregnancy it is interfering with speech and eating → remove surgically
- Local granuloma → simple local excisions
- Gingival fibromatosis → gingivectomy for esthetic reasons + drug modification if possible
- Hemangioma [identified by blanching on glass slab - **dyscopy**] :
If small → cryotherapy / laser therapy
If large → steroid injections or sclerosing agents
Huge → treated by cardiologist by stenting the feeding blood vessels
To differentiate between mucocele and hemangioma → FNA + hemangioma will blanch under glass slab
To differentiate between hemangioma and lymphangioma → hemangioma blanches under glass slab + ultrasonography of hemangioma shows active blood flow
- Lipoma → excision
- Lymphangioma / cystic hygroma → excision or picibanil injections [streptococcal antigen]
- Mucocele → excision with feeder salivary gland



Surgical management of cysts

- If FNA shows cheesy white material → OKC
- If FNA shows pus → abscess / infected cyst
- If FNA shows blood → vascular malformation / aneurysmal bone cyst
- If FNA shows air → you are in the maxillary sinus or traumatic bone cyst [solitary bone cyst]
- **Most cysts are managed by enucleation**
- **Enucleation [cystectomy]** = scooping the lesion out , stripping the cyst lining from the resorbed bone cavity
- **Marsupialization (cystostomy or Partsch I operation in Germany)** = changing a cyst into a pouch to decompress the lesion

Mandibular cysts are normally marsupialized into the oral cavity, although maxillary cysts can also be marsupialized into: maxillary sinus, nasal cavity, oral cavity



Indications:

- ✓ Large cyst can cause fracture of mandible
- ✓ Developing dentition
- ✓ Medically compromised patient

If Marsupialization is Used for Complete Resolution

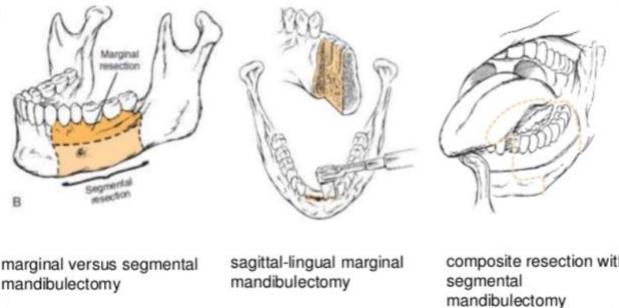
1. The patient must be cooperative and irrigate the cyst at least twice a day.
 2. A stent may need to be placed in the cyst to maintain the opening.
 3. complete elimination of the cyst is possible with marsupialization
 4. Marsupialization **can take a year or longer to perform** - The cyst lining changes to resemble normal oral mucosa
- **A aneuresmal / solitary bone cyst → curettage**
 - **Stpahne bone defect → no tx**
 - **Eruption cyst → will regress after eruption**



- **OKC Tx options:**

- enucleation as one piece + primary closure**
- Enucleation with chemical fixation** [Cornoy's solution – goes a few mm into bone to kill the remaining daughter cells]
- Enucleation + liquid nitrogen** [Liquid N₂ spray destroys the remanence of cystic lining]
Liquid nitrogen is better than Cornoy's solution because :
 - 1- It only goes 1-2 mm [cornoy's solution can go deeper and damage nerves]
 - 2- It preserves the organic component of bone → bone regeneration
 - 3- you can place an immediate bone graft → immediate reconstruction
 - 4- A temperature of -20°C is required to devitalize tissues, and only liquid nitrogen can deliver this on a consistent basis
 - 5- can cause temporary nerve parasthesia [cornoy can cause permanent damage to the nerves]
- En bloc resection [marginal or segmental]**

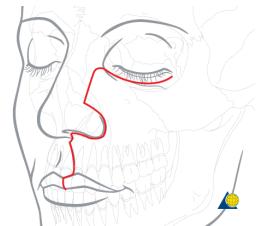
MARSUPLIZATION IS NOT A TX OF OKC – BECAUSE OF THE HIGH RECURRENCE RATE OF OKC





Surgical management of oral cancer

- The most typical form of oral cancer = ulceration
- Most common oral cancer = squamous cell carcinoma [mostly on the lower lips of outdoor workers]
- Most common site for SCC = lateral side of the tongue and floor of the mouth
- In case of submucous fibrosis = take a biopsy to R/o dysplasia
- HPV 16 & 18 are associated with oral cancer
- Erythroplakia → highest chance of progression into malignancy
- Management of lichen planus = intralesional steroids
- **Occult metastasis** = the lymph nodes are non palpable but there is microscopic metastasis [can only be detected by FNA]
- **Weber Ferguson incision is used to gain access for maxillectomy**
- **In case of malignant involvement of the lymph nodes → take FNA biopsy**
- **You wait for 14 days for an oral cancer biopsy result to come back**

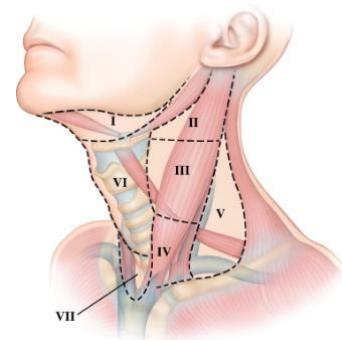


Elective neck dissection = you remove lymph nodes prophylactically and to detect occult metastasis

Therapeutic neck dissection = you remove all cancer involved lymph nodes

Radical neck dissection = you remove lymph nodes on level 1 till level 5 spinal accessory nerve, SCM muscle , internal jugular vein can be damaged and have to be removed with the lymph nodes

Neck syndrome = due to damage of the nerve that supplies that SCM





Surgical management of pathology

- **Best management for OKC** = enucleation followed by cryotherapy [liquid nitrogen] – to eliminate all daughter cysts or any remnants of the cyst lining
- **Primary treatment of melanoma** = radical excision

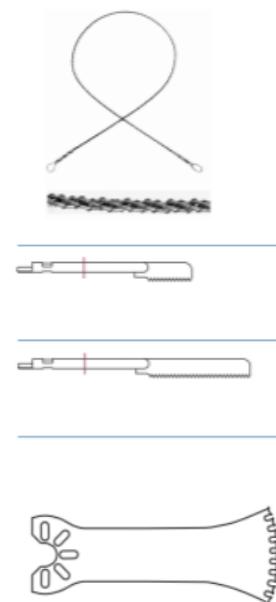
Diathermy / Electrocautery = cuts + coagulates + sterilizes at the same time [DISADV = creates charring in the tissue which delays healing and makes studying the histological slides much harder]

- A. **Monopolar** : coagulates Bvs less than 2mm , collateral damage + tissue burn
 - B. **Bipolar** : coagulates Bvs more than 2 mm, no collateral damage and less smoke
 - **Management of Portwine hemangiomas** = laser ablation
 - **Management of actinic keratosis** = cryotherapy
 - **Cryosurgery CAN NOT be used for cancer and leukoplakia**
 - **Central trigeminal neuralgia management** = cryotherapy
 - **Peripheral trigeminal neuralgia** = alcohol injections
- Healing of **cryosurgery wounds occurs slowly**.
- If a biopsy is needed it must be taken before cryosurgery
- Cryosurgery is **non-specific in its destructive effects**



Saws used for bone pathology :

- **Gigli Saw** → used for blind condyle head surgery – condylectomy
- **Reciprocating Saw** → used for Lefort I osteotomy, Mandibulectomy, Sagittal split osteotomy
- **Sagittal saw** → to obtain a symphysial bone graft





Q: what is the difference between a graft and a flap? A flap has veins and arteries intact [it's own blood supply] – a graft does not have intact BVs

Flaps classification	Details
According to blood supply	Random flaps: supplied by dermal and subdermal plexus [minor BVs] – limited length and width ratio Ex: buccal advancement flaps Axila flaps: supplied by more dominant and superficial BVs [major BVs] – greater length is possible Ex: Platylar rotation (greater p. artery) - Nasolabial (angular artery) - Forehead (Supratrochlear artery)
Configuration	Advancement flaps Rotation flap Transposition flap
Location	Ex: forehead flap, nasolabial flap, tongue flap ** 2 main muscles are used for distant flaps= latissimus dorsi and pectoralis major
Tissue content	
Method of transferring the flap	

Order of options to reconstruct a defect: skin graft [first option]

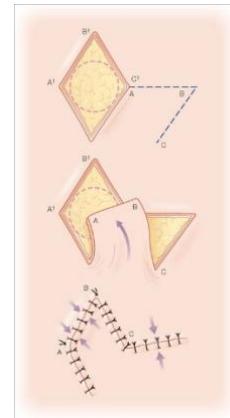
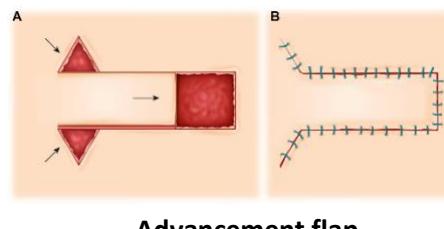
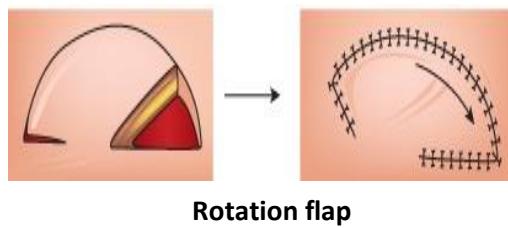
→ prosthesis → local flap → regional flap → free flap

Full thickness skin grafts are taken from :

- A. Back of the neck
- B. Upper eye lids
- C. Supraclavicular area x

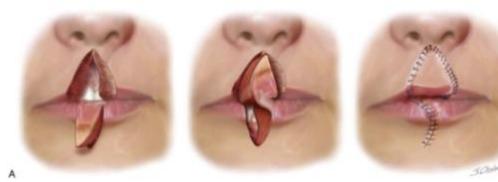
Causes of graft loss :

- 1- Hematoma / seroma under the graft
- 2- Shearing forces between the graft and the recipient site
- 3- Poorly vascularized recipient site
- 4- Infection [mostly by streptococcus species]





Abbey flap



Abbey flap is a transpositional flap used in the reconstruction of the upper lip

Q: The primary factor in incision placement in OMFS is = facial aesthetics

Facial incisions should :

- Be placed In inconspicuous [hidden areas] along the (lines of minimal tension/ wrinkles)
- Avoid damage to the facial nerve [motor nerve]
- Avoid damage to sensory nerves
- Avoid large Bv's

If you need to place incisions in a young pt that does not have wrinkles: ask them to smile to reveal the " dynamic wrinkles"

Dynamic wrinkles = lines that form when the pt smiles or frowns

Branches of the facial nerve [motor nerve] :

- 1- Temporal
- 2- Zygomatic
- 3- Buccal
- 4- Marginal mandibular
- 5- Cervical

Submandibular incisions [to remove stones/ lesions, reduction of fractured mandible] are close to the marginal mandibular nerve MMN [branch of the facial nerve].

Damage to the marginal mandibular nerve will cause paralysis of depressor anguli oris and depressor labii inferioris [the lower lip and corner of the mouth will drop down]

- **Q: an approach to reduce zygomatic fractures = gillies approach**
- **Q: damage to infra orbital nerve = loss of sensation in the lower eyelid, upper lip, lateral side of the nose**
- **Q: best bone graft for the orbital floor is obtained from = cranial bone**
- **Q: best autogenous graft source = chin symphysis**
- **Q: ectropion is a complication of = infra orbital incision**

Approaches to access the face:

A. Extraoral approaches: [better accessibility specially to reduce fractures]

- **Temporal approach** = Gillies approach, to reduce zygomatic arch fractures [there is risk of damage to superficial temporal arteries]
- **Lower eye lid approaches** = to gain access to the orbit [there is risk of damaging infraorbital nerve, scar formation and ectropion]



The skin laxity in the lower eyelid makes this area resistant to keloid formation

Ectropion : scarring of **infra orbital incision** that leads to → contraction of the lower eye lid + it looks everted outside leading to dryness of the eyes



- **Transconjunctival approach [inferior fornix incision] :** Best one to expose the orbital floor and infraorbital rim [less complications]
- **Coronal approach:** incision is made at the hair line – to gain access to the anterior cranial vault , forehead, middle and upper regions of the facial skeleton [used in lefort III fractures]

B. Intraoral approach : [no scarring + no damage to facial nerve]

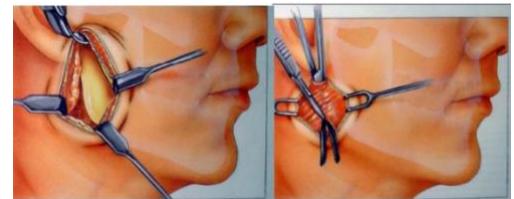


- **Mucogingival approach** = for endo surgeries and surgical extractions
- **Vestibular approach** = to gain access for le fort I osteotomy, access to chin symphysis to obtain symphysial bone graft [**gives access to basal bone not alveolar bone**]

Vestibular approach complications: bleeding, muscle ptosis, nerve injury , wound dehiscence

C. Trans facial approach:

- **Symphysis** = if you want to gain access to the chin
- **Submandibular [Ridson approach]** = if you want to access body / angle of the mandible, ramus, submandibular region, TMJ
- **Retromandibular** = to fix high condylar fractures – best access to insert a plate [**risk of damage to greater auricular nerve**]



NOTE: the minimum safe distance between the MMN of the facial nerve and the inferior border of the mandible = 1.5 cm

What could be damaged in access to TMJ?

- Parotid gland + external auditory canal
- Maxillary artery + superficial temporal vessels
- Facial + auriculotemporal nerves

Those complications can be prevented by accessing through a submandibular approach

Auriculotemporal nerve syndrome / Frey syndrome = due to **damage of the Auriculotemporal nerve** [Auriculotemporal nerve has parasympathetic supply to parotid gland and sympathetic supply to sweat glands , when it is damaged → sweating + flushed skin when the pt eats (area become hot and red)]





Q: safest approach for condylar neck : pre auricular approach

Q: approach for TMJ : retromandibular + submandibular approach





Local Anesthesia

Most favoured LA theory = specific receptor theory (LA agents reversibly block Na⁺ channels → inhibits polarization by preventing the influx of Na⁺ → no impulse propagation)

LA is used for: preventing pain + diagnostic purposes

LA advantages:

- 1- Bloodless field
- 2- Painless procedure
- 3- You can maintain communication with the patient compared to GA
- 4- Cheaper and easier to administer compared to GA
- 5- You can administer it alone while you need company if you are doing GA (you need nurses and anesthesiologist)
- 6- You can do it in a normal clinic while you need a hospital for GA (operating room fully equipped)
- 7- Patient doesn't need to fast – compared to GA

LA content:

- 1- Active agent
- 2- Preservative – antibacterial : methylparaben / anti fungal : thymoral
- 3- Vasoconstrictor : adrenaline / nor adrenaline / felypressin
- 4- Reducing agent: Vasoconstrictor preservative – sodium meta bisulfite (it preserves the vasoconstrictor by lowering the PH this provides slower onset of action and more burning sensation during injection)
****patients with bisulfite allergies are given LA without vasoconstrictor**
- 5- Vehicle: ringer's solution (sodium chloride 0.5 gm , potassium chloride 0.02 gm , 100 cc distilled water)
- 6- Buffer : sodium hydroxide (necessary since sodium meta bi sulfite lower the PH and increasing burning sensation during injection – buffers the LA PH and keeps it between 6-7)
**** PH of LA = 6-7**

LA structure:

- Aromatic portion (benzene ring) – lipophilic (provides lipid solubility)
- Amide portion – hydrophilic (water solubility)
- Ester (-COO-) or Amide (– NH-) intermediate link

MOST LA IS AMIDE GROUP

Esters are metabolized in the plasma by pseudocholine esterase (not stable)

Amides are metabolized in the liver (more stable)

Active agent with 2 ii → Amide (ex: Lidocaine)

active agent with one i → ester (ex: procaine)

Prilocaine causes met hemoglobinemia → reversed by methylene blue



In pts with liver disease → decrease dose of lidocaine or avoid using it (since it is metabolized in the liver)

LA inhibit the central inhibitory neurons → CNS stimulation → convulsions

At a higher dose LA inhibits both inhibitory and excitatory neurons → CNS depression → resp depression + death

ALL LA CAUSE VASODILATION WHICH LEADS TO:

- 1- Increase rate of absorption into the blood stream → decrease duration of action of LA
- 2- Increase bleeding
- 3- Possible over dose reactions (hypotensive shock)

Only cocaine causes vasoconstriction (cannot cause hypotensive shock)

VC are added to :

- 1- prolong the effect of LA
- 2- decrease the rate of absorption → decrease bleeding and chance of systemic toxicity

Vasoconstrictors:

- 1- Adrenaline: acts on both Alpha and Beta receptors
 - Alpha activation → contraction of smooth muscles
 - Beta activation → inc in HR , vasodilation of skeletal and cardiac BVS

Adrenaline / epinephrine causes B2 activation which causes vasodilation in skeletal BVS → counteracts the effect of the vasoconstriction caused by Alpha 1 activation

- 2- Nor adrenaline/ levonordefrin: acts on alpha more than beta receptors → constricts all BVS → increase in BP (careful giving it to HTN patients)
- 3- Felypressin (octapressin) : synthetic analogue of ADH (anti diuretic hormone) vasopressin
** CAN'T BE USED IN PREGANT PT BECAUSE IT HAS OXYCTIC EFFECT → CAUSES UTERINE MUSCLE CONTRACTION

Q: why is differential block achieved in LA (why is pain blocked and not other sensations)?

Local anesthetics block conduction in the following order: small myelinated axons (e.g. those carrying nociceptive impulses), non-myelinated axons, then large myelinated axons.

Effectiveness of LA depends on:

- 1- LA (type, amount or volume given , concentration, whether it has VC or not)
- 2- PT factors (inflammation and PH of the site of injection, pain, vascularity of the site of injection)
- 3- Dentist factors (knowledge and correct technique of injection)



The free non- ionized base form of LA is the one that crosses the tissue membranes.

In case of inflammation the PH of the tissue drops and becomes more acidic → LA will become ionized and ineffective to penetrate the tissue

Small fibers are blocked faster because the anaesthetic concentration to the critical length will be reached faster (you need to block 3 nodes of ranvier – which are closer together in small fibers)

A 2% solution has 20 mg/ml – 3% has 30 mg/ ml etc..

EMLA = topical skin anaesthetic (2.5% lidocaine + 2.5% prilocaine)

1:100,000 = (10 µg/mL) 1:200,000 = (5 µg/mL) epinephrine

AMIDES	Lidocaine	Gold standard LA = 2% solution Topical = 5-10-20% (adhesive patch has 20%)
	Prilocaine	LA = 3% (combined with felypressin) or 4% plain ** if you need to use a VC free LA use plain prilocaine because it produces less vasodilation than lidocaine.
	Mepivacaine	LA = 2% + 1:100 000 epinephrine or 3% plain
	Articaine	LA= 4% + 1:100 000 epinephrine or + 1:200 000 epinephrine ** metabolized very quickly and produces least toxicity
	Bupivacaine	LONG LASTING UP TO 8 hours (due to protein biding property that acts as a reservoir to replenish the drug that is metabolized and absorbed) ** bupivacaine binds to proteins 96% and lidocaine 64% Ampoules and not cartridges 0.25% to 0.75 % +/- 1: 200 000 epinephrine
ESTERS	Procaine	Procaine is the only injectable ester LA ONLY USED IF THE PT IS ALLERGIC TO ALL OTHER AMIDES
	Cocaine Benzocaine Amethocaine (topical)	Benzocaine – topical an aesthetic agent (20% gel) ** Cannot be injected because it is insoluble in water

LA syringe

Needle : presterilized – St steel – disposable

Needles are used for one pt only (can be used multiple times for the same pt but the sharpness of the needle decreases after each injection and becomes blunt) → better change the needle after each injection

You always need to consider the gauge (outside diameter of the needle) and the length of the needle



Most common gauges are 27 and 30 - 27 gauge needles are 0.4 mm wide / 30 gauge needles are 0.3 mm wide (the larger the number the smaller the diameter)

- 25 gauge = red
- 27 gauge = yellow
- 30 gauge = blue

Why do we prefer using larger gauge needles?

- 1- Less deflection
- 2- Greater accuracy
- 3- Less chance of breakage
- 4- Easier aspiration
- 5- No difference in pt comfort

When do you use large gauge needles (gauge 25 or 27) – when the risk of positive aspiration is increased like in IAN block – PSAN block – incisive and mental nerve block

Bevel of the needle should be towards the bone – sometimes there are dots on the hub of the needle indicating where the bevel is.

Needle lengths : length you choose depends on amount of tissue penetration needed

- Ultrashort = 10 mm
- Short = 20-25 mm
- Long = 30-35 mm

Scoop technique is used to recap needles- modified scoop technique is used another barrier or instrument to hold the cap while you re insert the needle.

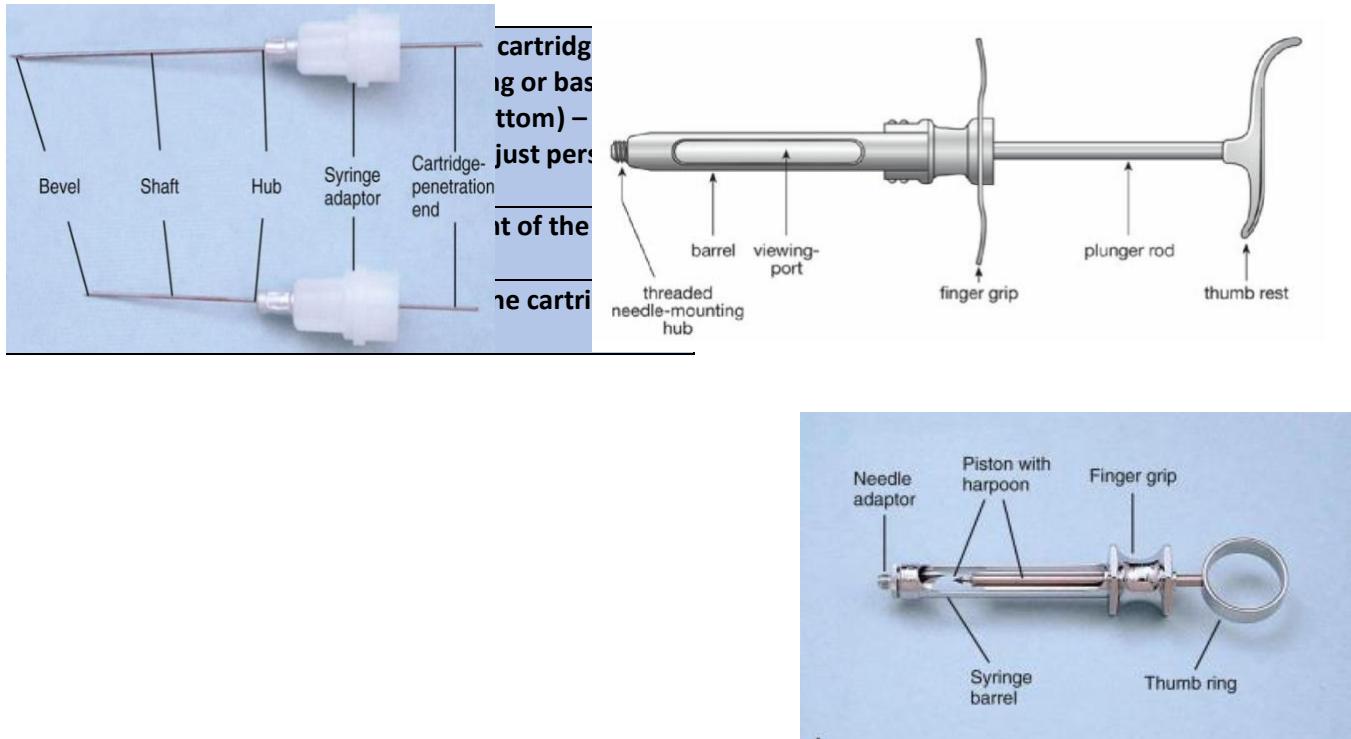
** if you need to change the direction of the needle you remove it completely from the tissue then reinser it again in the correct direction (changing direction inside the tissue increases the chance of breakage)

How can you avoid needle breakage?

- 1- Don't change needle direction inside the tissue
- 2- Don't force the needle against any resistance
- 3- Don't force the needle all the way to the hub

Q: what does it mean if the patient feels pain during the withdrawal of the needle?

A:it is caused by fish hooks “barbs” on the needle that form when the needle contacts sth hard like bone



Q: why do we aspirate before injections? To make sure we are not in a blood vessel and avoid intravascular injections which might lead to toxicity.

Syringes	
According to aspiration	According to clinical use
Aspirating	Conventional
Non aspirating	Computerized (allows slow steady injections)
Passive aspiration	Powered injectors (force anesthesia through the mucosa without a needle either mechanically or by gas pressure)
	Intraligamentary (pistol grip or pen grip)

carpule (cartridge) : are either glass or plastic (they all always clear to allow visualization of the content)

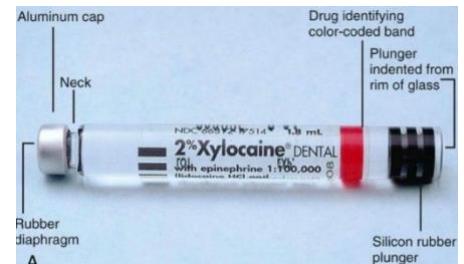
Q: what should be written on the carpule?

Content the LA active agent and the VC, concentration of both active agent and VC, expiry date , manufacture's batch number

Q: what are the available sizes of carpules? 1.7, 1.8, 2, 2.2 ml

Glass cylinders = can be used for all type of injections

Plastic cylinders = CAN'T BE USED FOR INTRALIGAMENTARY INJECTIONS (because the high pressure can distort the carpule and cause loss of content from the plunger end)





Plungers are either solid or hollow and they might contain latex → AVOID IN LATEX ALLERGY PTS

Cartridges should not be used if: IMP

- 1- there is no information about the contents on the cylinder
- 2- the expiry date has passed
- 3- the solution is cloudy
- 4- there is a crack or fracture in the cylinder
- 5- there is a large air bubble obvious in the solution
- 6- the plunger is extruded from the end of the cylinder.

Dosage and complications

Eventually all of the LA dosage will be absorbed into the blood to be metabolized and excreted – the maximum safe dose is usually not injected

For every 10 kg = 1 carpule

Calculating the dosage of a carpule:

Regardless of the type of anesthetic solution : 2% = 20 mg / 3% = 30 mg / 4% = 40 mg

- How many mg of LA does a 1.8 ml carpule of 2% lidocaine have? $1.8 \times 20 = 36 \text{ mg}$
- How many mg of LA does a 2.2 ml carpule of 2% lidocaine have? $2.2 \times 20 = 44 \text{ mg}$

Maximum dose:

LA + epinephrine = 7 mg/kg of body weight (DON'T EXCEED 500 mg)

LA alone without VC = 4.4 mg/kg of body weight (DON'T EXCEED 300 mg)

Ex: if a pt weights 50 Kg what is the maximum number of carpules they can take?

50×7 (max dose per kg if the LA is with VC) = 350 mg

$350 / 44 = 8$ carpule of 2.2 ml

$350 / 36 = 10$ carpules of 1.8 ml

CNS toxicity occurs when lidocaine concentration is 5 mg/l

Adding VC = delays the entry of the LA into the blood stream but has LITTLE EFFECT ON THE PEAK PLASMA CONC

Epinephrine:

- 1- Increases the risk of CNS toxicity because it alters the distribution of blood sending more blood to the brain
- 2- Stimulates B1 receptors → Causes increase in cardiac output by increasing Force of contraction and HR → increase in BP
** hemostasis in this case is produced by alpha stimulation (which causes vasoconstriction in peripheral blood vessels)



- 3- Stimulates B2 receptors → vasodilation in BVs of skeletal muscles → decrease diastolic BP
- 4- Decrease plasma potassium → can lead to arrhythmias

METABOLISM: understanding metabolism is imp because you need to consider this in medically compromised patients

- Amides are metabolized in the liver (consider age, hepatic function: if a patient is above 65 Years old their hepatic function is 50% less than a 25 yo therefore if a patient is 65 y or above → reduce the max dose by half)
- prilocaine is also metabolized in the lung
- articaine is an amide but undergoes intial metabolism in the plasma

common complications:

Methemoglobinemia	Prilocaine causes Iron in HB changes from ferrous to ferric state changing hemoglobin to methemoglobin reducing it's capacity to carry oxygen → cyanosis (unlikely in small doses , may occur in children)
Allergy	More common in esters than amides Some old LA may cause allergy due to the preservative used LA allergy can be type 1 (anaphylactic shock and can be type 4 delayed rxn) ** reducing agent (VC preservative – sodium metabisulfite) can produce allergy in pt with Sulphur/ bisulphite allergies

In medically compromised patients: you consider underlying condition + any drug interactions	Type	Immune System Involvement	Antigens (Allergens)	Exemplary Diseases
	Type 1	Immunoglobulin E (IgE)	Pets (dander), dust, mold, pollen, medications, venoms, foods	Allergic rhinitis, asthma, eczema, anaphylaxis,
	Type 2	Immunoglobulin G (IgG)	Drugs, other chemicals	Hemolytic anemia
	Type 3	Immunoglobulin G (IgG)	Drugs, other chemicals	Glomerulonephritis
	Type 4	Lymphocytes	Various chemicals	Contact dermatitis (poison ivy)

PATIENT CONDITION	MANAGEMENT
UNCONTROLLED ARRYTHEMIA / UNSTABLE ANGINA	Avoid epinephrine and use felypressin as alternative ** high doses of felypressin can cause coronary artery vasoconstriction Max of 3 cartridges of felypressin
OTHER CARDIAC CONDITIONS	No need to avoid epinephrine Follow dose reduction (no more than 2 cartridges of epinephrine)



PHAEOCHROMOCYTOMA - CATECHOLAMINE-PRODUCING TUMOUR OF THE ADRENAL GLANDS	ABSOLUTE CONTRAINDICATION TO USE EPINEPHRINE
PREGNANCY	Avoid prilocaine because it crosses the placenta the most Avoid bupivacaine because it can cause fetal hypoxia Use lidocaine
PACEMAKERS / EPILEPSY	Avoid electronic dental anesthesia TENS
HEMOPHILIA	Avoid regional blocks (risk of bleeding) – unless there is prophylaxis of factor 8 U can use intraligamentary injections
ENDOCARDITIS	Avoid intraligamentary injections (produces a lot of bacteremia)
DRUG	INTERACTIONS
ANTICONVULSANTS (PHENYTOIN)	Both lidocaine and phenytoin depress cardiac activity
ANTIMICROBIALS (SULFONAMIDES, PROTEASE INHIBITORS)	sulfonamide antibacterials can exacerbate the methaemoglobinemia produced by prilocaine. (may even occur following topical application of the local anaesthetic.) Protease inhibitor drugs used in the management of HIV raise the plasma levels of lidocaine and potentially increase cardiotoxicity
BENZODIAZEPINES (MIDAZOLAM, DIAZEPAM)	Midazolam + lidocaine = midazolam decrease the CNS toxicity of lidocaine Diazepam + bupivacaine = diazepam raises the level of bupivacaine → toxicity
BETA BLOCKER	b- blockers decrease blood flow to liver + inhibit hepatic enzymes → higher chance of amide toxicity *reduce dosage to avoid CVA / stroke B stimulation → drop in diastolic BP and Alpha stimulation → increase in systolic BP If beta is blocked , alpha works un opposed → rise in systolic BP → stroke
CALCIUM CHANNEL BLOCKERS	Verapamil increases toxicity of lidocaine and bupivacaine Increases epinephrine induced hypokalemia *reduce dosage
DIURETICS (CATECHOLAMINE)	Decreases plasma potassium → epinephrine induced hypokalemia *dose reduction
ANTI DEPRESSANTS (TCA AND MAO INHIBITORS)	TCA- inhibit epinephrine re uptake MAO inhibitors – no effect on LA (they exhibit their effect in a late stage of epi metabolism)
GA	Halothane increases cardiac sensitivity to epinephrine *reduce dosage to half
DRUGS OF ABUSE (AMPHETAMINE, CANNIBAS, COCAINE)	Sympathomimetic drugs increase epinephrine toxicity *reduce dosage / avoid epinephrine if pt took those drugs in the past 24 hours



ANAESTHESIA TECNIQUES - Mandibular teeth:

6 nerve blocks exist for mandibular teeth:

- 1- Mental
- 2- Inferior alveolar
- 3- Incisive
- 4- Long buccal
- 5- Gow gates (you block the mandibular nerve)
- 6- Vazirani – Akinosi (closed mouth technique in case of trismus)

If you want to have single pulpal anesthesia of a single tooth without facial and lingual soft tissue anesthesia →

- Intraseptal
- Intraosseous
- Intraligamentary

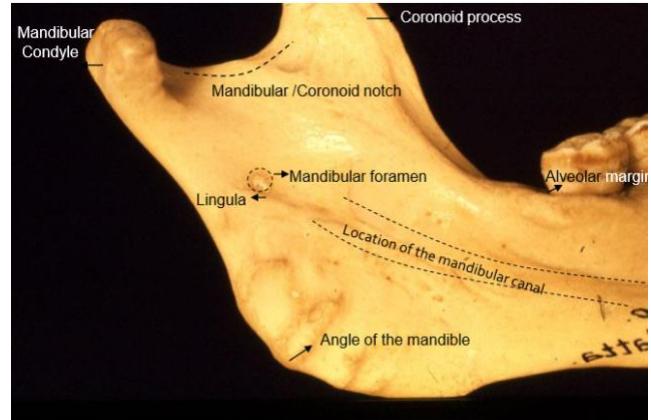
Nerve block	Advantages / disadvantages	Indications / contraindications	areas anesthetized
Inferior alveolar nerve block	Advantage : one injection provides a wide range of anesthesia (useful for quadrant dentistry) Disadvantage: <ol style="list-style-type: none"> 1- Wide range of anesthesia 2- Highest chance of positive aspiration (intravascular injections) 3- Indv variation in intraoral landmarks 4- Lingual + lower lip anesthesia (discomfort and dangeroud for some pts) 5- Inadequate anesthesia in case of bifid IAN or bifid canal 	Indications: <ol style="list-style-type: none"> 1- Procedures on multiple mand post teeth in one quadrant 2- When anesthesia of the buccal ST anterior to the first molar is needed. 3- When anesthesia of the lingual St is needed Contraindications: <ol style="list-style-type: none"> 1- Inflammation / infection at the site of injection 2- Mentally retarded patients/ young children (any patient that is expected to bite their lip/tongue frequently after anesthesia) 	1- mandibular teeth to the midline 2- body of the mandible 3- inferior portion of the ramus of the mandible 4- Buccal mucoperiostem + mucus membranes anterior to the first molar (by the mental nerve) 5- Lingual soft tissue and periosteum (by the lingual nerve) ** buccal mucosa is anesthetized by the long buccal nerve block ** buccal mucosa anterior to the first molar is anesthetized by the mental nerve + long buccal



IAN block technique: you block IAN + lingual nerve

[adult] 25 gauge long needle

- 1- Palpate the outer surface of the mandible and locate the external oblique ridge
- 2- Then palpate internal surface of the mandible and locate internal oblique ridge
- 3- Palpate the greatest concavity on the anterior border of the ramus (coronoid notch)
- 4- Locate the pterygo mandibular raphe , place the thumb in the retromolar fossa
- 5- Approach from the contralateral premolars , Inject in the mid point above the thumb (above the retromolar fossa) and lateral to the pterygomandibular raphe
- 6- Feel the touch of bone (indicating touching the lingula above the mandibular foramen)
- 7- Aspirate to make sure you aren't in a blood vessel , inject slowly
- 8- Leave 1/3 of the carpule and inject it as you withdraw the needle to anesthetize the lingual nerve.



[children] 30 gauge long needle

Same but the needle should be directed apically because the mandibular foramen in lower in children

Pterygomandibular raphe is the attachment b/w the superior constrictor muscle and the buccinator

Nerve block	Technique	Areas anesthetized
Long buccal	Inject above and lateral to the occlusal plane of the last molar	Mucus membranes + gingiva from retromolar area to the 2 nd premolar In premolar region it anastomoses with mental nerve
Long buccal nerve arises from the lingual aspect of the ascending ramus – crosses the retromolar area and appears laterally into the buccal sulcus		

Lingual nerve is parallel to IAN, anterior and medial to it (in the infratemporal fossa)

- If you are extracting anteriors there will be cross innervation from the opposite side
- If you are extracting premolars there will be cross innervation from the long buccal and mental nerve
- The only tooth that can be extracted with a single nerve block is the canine (because it is only innervated by the mental nerve)

To check for LA, you insert a probe in the gingiva around the tooth to be extracted+ the patient will report feeling numbness in the lower lip and the side of the tongue

ANAESTHESIA TECNIQUES – Maxillary teeth:

Infiltration anesthesia = suitable for all teeth (because the maxilla is more porous than the mandible)



Pulpal anesthesia when LA reaches medullary bone.

Maxillary blocks:

- 1- Posterior superior alveolar nerve block
- 2- Greater palatine nerve block
- 3- Infraorbital nerve block
- 4- Nasopalatine (incisive nerve block)

Nerve blocks in the maxilla are used when:

- 1- Infiltration fails
- 2- You need extended field of anesthesia
- 3- There is an infection / inflammation
- 4- Deep bone surgery

We avoid injects at the periosteum because it is highly innervated and if touched pain can persist for a few days after. (inject first supraperiosteally to anesthetize the periosteum then inject subperiosteally)

Infiltration according to needle penetration :

- 1- Submucous
- 2- Supraperiosteal
- 3- Subperiosteal
- 4- Intrabony

Type	Technique
Infiltration	<ol style="list-style-type: none"> 1- Pull the lip / cheek firmly out (this will make the tissue tense and firm → less force is required during injection → less irritation) 2- Topical with benzocaine / xylocaine 3- Insert the needle in the fornix (junction of keratinized and non keratinized tissue) <ul style="list-style-type: none"> *Anteriors and premolars: needle parallel to the long axis of teeth (mesiodistally) and at 45 degrees (bucolingually) *Posterior : needle is 45 degrees in both bucco lingual and mesiodistal
PSAN block (posterior Superior)	<p>Short needle</p> <p>Not painful because no bone is contacted (LA is deposited in large ST area)</p> <p>Areas anesthetized: maxillary molars (except mesiobuccal root of max first molar)</p> <p>Injection site : distal to the maxillary tuberosity</p>
MSAN block (middle Superior)	<p>Areas anesthetized: pulp and buccal mucosa of MB root of max first molar, first and second premolar</p> <p>Injection site: superiorly between the two premolars</p>
ASAN block / IAN (anterior superior/	Areas anesthetized: (extra- oral and intraoral approach)





inferior alveolar nerve block)	<ul style="list-style-type: none"> • pulp and buccal mucosa of maxillary central to canine (by ASAN) • Lower eyelid (by infra palpebral nerve) • Lateral aspect of the nose (by lateral nasal) • Upper lip (by supralabial) <p>Site of injection: The concavity below the infraorbital ridge (place your finger here to prevent the solution from going into the patient's eye and causing temporary double vision caused by paralysis of extra ocular muscles) Double vision – give the patient an eye patch to prevent dryness of the sclera</p>	
Palatal infiltration	<p>Area anesthetized : palatal mucosa of the tooth</p> <p>Site of injection: midway between the free gingival margin and the mid palatal suture , perpendicular to the palate from the opposite side, touch bone then withdraw a little bit and inject a few drops</p>	
Greater palatine block	<p>Areas anesthetized: palatal mucosa of all teeth up to the max canine</p> <p>Site of injection: distal to the second molar at 45 degrees from the opposite side , close to the free gingival margin</p>	
Nasopalatine block	<p>Areas anesthetized: soft and hard tissues of the six max anterior teeth</p> <p>Site of injection: parallel to the long axis of the max centrals behind the incisive papilla</p>	

LA complications:

1- Failure of LA :

- Wrong technique ***MAIN CAUSE***
- Anatomical variations (bifid nerves, course of the nerve, anastomoses of nerves, secondary supply by another nerve) * SECOND MOST COMMON CAUSE*
- Inadequate dose
- Inflammation in the area (low PH, anesthesia can't enter the tissue because it will be ionized)
- Pt anxiety (reduces pain threshold)
- Toxicity by injecting in a BV

2- Pain on needle insertion * second most common complication in needle injections*

3- Syncope / fainting ** most common complication in needle injections**

4- Infection

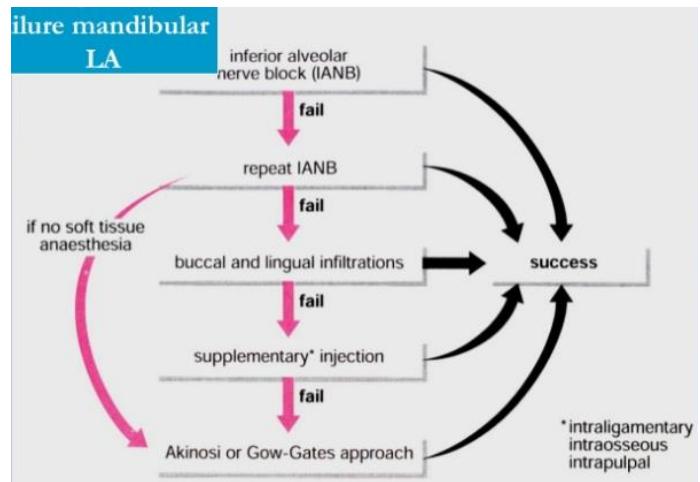
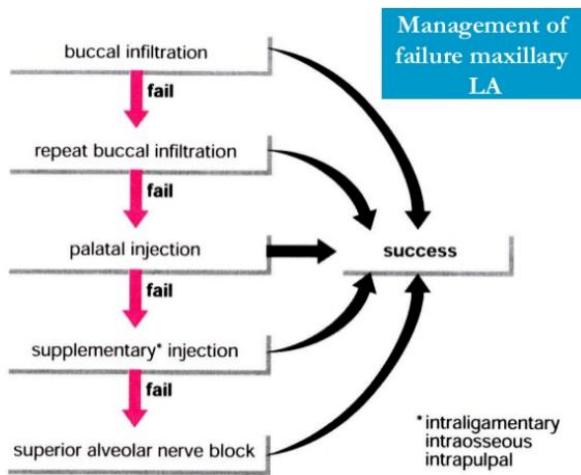
5- Trismus

6- Broken needle (always breaks at the hub)



7- Edema / hematoma

8- Paresthesia



Most common complication of needles → vasovagal attack (syncope)

Peripheral vasodilation → less blood to the brain

Management : trellendelenberg position (tilt the chair back to raise the legs and allow blood to go back to the brain

Pain on injection caused by:

- 1- Injecting in a site of inflammation/ infection
- 2- Wrong technique
- 3- Needle contamination

Burning during injections caused by:

- 1- PH of the solution itself
- 2- Fast injections
- 3- Needle contamination
- 4- Warmed solutions *

Needle breakage caused by :

- 1- Inserting the needle to the hub
- 2- Sudden patient movement
- 3- Thin needles / defect in manufacturing

Management: remove it using a hemostat or McGill forceps only if u can localize it (if you can't

Prevention: Don't use thin needles / don't insert to the hub/ don't bend the needle

Paresthesia: caused by :

- 1- Damage to the nerve

Q: how can you reduce pain of LA injections?

- 1- Use sharp and small gauge needles
 - 2- Aspirate to avoid intravascular injections
 - 3- Glass cartridge to allow steady injections
 - 4- LA temp should be between 15-37 degrees
 - 5- Slow injections and slow removal of needle
 - 6- Apply topical anesthesia
 - 7- Stretch mucosa firmly
 - 8- Use correct technique – position supraperiosteally and bevel towards bone
- *LA + VC → PH = 3.2 LA alone → PH = 6.8



- 2- Needle contamination (alcohol or sterilizing solution)
 - 3- Expired LA or if it is taken from a vial not a cartridge
 - 4- Hematoma
 - ** neurapraxia = damage only in the outer portion of the nerve → most favourable prognosis
 - Axonotmesis: moderate prognosis
 - **Neurotmesis : poorest prognosis (the nerve is cut through and through)

Paresthesia leads to: Self inflicted injury / and effects QOL

Management of paresthesia:

- Most will self resolve in **8 weeks**
 - You explain it to the patient that it is common and calm the pt down
 - Do mapping (ask the pt to close their eyes and record the area of sensation loss then take a photo and compare it after a few weeks)

Facial nerve paralysis happens in:

- 1- IAN block (if you go distally and deposit LA in the parotid gland capsule in the infratemporal fossa)
 - 2- Infiltration of max canines
 - 3- Overinsertion in wazirani akinosi technique

IAN block = you are actually anesthetizing the buccal branch of the facial nerve

Clinical presentation:

- Drooping of the upper eye lid and corner of the mouth
 - Loss of nasolabial fold

If it is chronic food will accumulate in the buccal sulcus

Management:

- 1- Calm the pt down and explain that this is temporary for a few hours
 - 2- Remove contact lenses if the pt uses them + provide eye patch to protect the eye from dryness

Trismus caused by:

- 1- Trauma to the muscles and BVS (hemorrhage) during LA injections
(IAN block might damage medial pterygoid muscle and long buccal might damage masseter muscle)
 - 2- Needle contamination
 - 3- Infection
 - 4- Large amount of LA injected in a small space
 - 5- TMJ ankylosis / dysfunction / muscle fibrosis
 - Immediate trismus – due to injury
 - delayed trismus – due to contamination of solution or needle



Management :

- Apply heat packs to the area
- Warm saline rinses
- Analgesic + anti-inflammatory
- Ask the pt to open and close the mouth several times every few hours
- If it persists for few days refer to OMFS

** if the pt comes with severe trismus and requires dental care you can give vasirani akinosi technique

DD of an ulcer like lesion on the lower lip:

- 1- Self inflicted injury (LA in childr3n or mentally retarded pt)
- 2- Injury by a bur or by heat from the instruments

To prevent self inflicted injury : give short acting anasthesia + warn the pt not to bite their lips

Management:

- Analgesics + ABX in medically compromised pts
- Warm saline rinses
- Put petroleum jelly on it

** if the pt suddenly develops a lesion 2 days after LA around the site of injection → herpes simplex or aphous ulcer

Hematoma caused by:

Injury to an artery causing fusion of blood into the extravascular spaces and facial bruising that lasts fro 7-14 days.

Injury to a vein does not cause hematoma (veins don't have pumping of blood like arteries)

MOST COMMON AREA TO GET HEMATOMA IS DURING PSAN BLOCK DUE TO PRESCENCE OF PTEYRGOID VENOUS PLEXUS.

Prevention:

- 1- Use short needle for PSAN block to avoid damage to pterygoid venous plexus
- 2- Reduce number of injections
- 3- Don't probe the tissue with the needle

Management: Apply pressure for 2 minutes (IAN – pressure on medial side of ramus / ION – pressure over the infraorbital foramen)

Most common complication in PSAN → Hematoma Manifested as : bruising at the zygomatic area

Hematoma in ION causes bruising around the orbital rim (circumorbital ecchymosis)



- NERVE BLOCKS ARE CONTRAINDICATED IN PTS WITH HEMATOLOGICAL PROBLEMS → if hematoma occurs it can easily spread to the neck and affect breathing .
- Subconjunctival hemorrhage occurs in orbital floor (blow out) fractures
- topical anesthesia should not be applied for more than 2 mins
- idiosyncrasy = unexplained rxn of a drug (severe response to a small dose of drug)
- **toxicity occurs after 5 – 10 mins of injection (more common in block injections and plain LA without VC)**
- **it's contraindicated to give subperiosteal or intraligamentary injects to pts with cardiac problems it can lead to hypertension and arrhythmias (because you are injecting LA in a confined space which forces the LA into the BVS)**

toxicity occurs:

- 1- high dose / concentration
- 2- intravascular injections
- 3- problems in elimination / detoxification of the LA

Clinical signs of LA toxicity :

- S- slurred / difficult speech
- A-altered CNS activity (dizziness, confusion , arrhythmias)
- M- muscle tremors
- S- seizures (resp and cardiac arrest)

Management:

- Conscious pt: position the pt comfortably and give O₂ and monitor for an hour
- Unconscious pt : supine position, head tilt chin lift, give O₂, call paramedics

To prevent toxicity:

- 1- Proper medical history
- 2- Aspirate before injecting
- 3- Use VC when possible
- 4- Use the minimum dose and concentration that is effective
- 5- Monitor your pt after LA

Dose reduction is done in: (you give half the dose)

- 1- Liver problem pts
- 2- Children
- 3- Elderly

Allergy clinical signs: after injection pt develops skin rash , chest discomfort, difficult breathing

Management :

- **Conscious:** position pt comfortably + call ambulance



- **Unconscious:** position the pt in their recovery position (on their side supported by one leg and one arm, head tilted back and chin lift) + call ambulance

Anaphylaxis cause histamine release by IgE → vasodilation and bronchoconstriction

For anaphylactic shocks give epinephrine: to cause vasoconstriction and bronchodilation

Epinephrine dosage: (IM injection in the antero lateral side of the middle 3rd of the thigh)

- Adult = 0.5 ml of 1:1000 epi
- 6-12 years old =0.3 ml
- Less than 6 = 0.15 ml

Infraorbital injection / injection in pterygomaxillary space → can lead to cavernous sinus thrombosis due to emissary veins in this area



Medications in Oral Surgery

EMERGENCY MEDICATIONS

EMERGENCY MEDICATIONS

CONDITION	MEDICATION + DOSE
ALLERGIC REACTIONS [ANAPHYLAXIS]	Adrenaline, 1-ml ampoule of 1:1000 solution for intramuscular injection
ANGINA / MYO CARDIAL INFARCTION	Aspirin, 300 mg dispersible tablets
SEVERE HYPOGLYCEMIA [UNCONSCIOUS PT]	Glucagon, 1 mg IM injection
ANGINA	Glyceryl trinitrate (GTN) spray or sublingual tablet
EPILEPSY / CONVULSIONS	Midazolam buccal liquid, 10 mg/ml Midazolam injection (as hydrochloride) 5 mg/ml [2-ml ampoules]
HYPO GLYCEMIA	Oral glucose
ASTHMA ATTACK	Salbutamol inhaler, 100 µg per actuation
MILD ALLERGIC RXN	Cetirizine 10mg tablets or oral solution (5mg/5ml) Chlorphenamine 4mg tablets or oral solution (2mg/5ml)

ABX prophylaxis:

Conditions that need ABX prophylaxis :

- 1- Prosthetic **cardiac valves, including homografts**
- 2- **History of infective endocarditis**
- 3- Cardiac transplant with valve regurgitation due to a structurally abnormal valve
- 4- Unrepaired cyanotic congenital heart disease, including palliative shunts and conduits
- 5- Repaired congenital heart defect with residual shunts or valvular regurgitation

For all dental procedures that **involve manipulation of gingival tissue or the periapical region of the teeth, or perforation of the oral mucosa.**

The ABX ideally is given before surgery but if not given before can be given up to **2 hours after surgery**

NOTES:

- If the patient is already taking antibiotics for another condition → select an antibiotic from a different class than the one the patient is already taking. [if the patient is taking amoxicillin, the dentist should select clindamycin, azithromycin or clarithromycin for prophylaxis]
- If the pt requires ABX and takes the ABX then comes the second day for another procedure that requires ABX prophylaxis you should give them again.
- ABX prophylaxis is not required for healthy pts
- There is no evidence that implant failure is prevented by antibiotic usage

Q: when should I give ABX medication for my pt ? ***

- 1- Cellulitis and facial space infection
- 2- Systemic infection (fever, lymphadenopathy and trismus)



- 3- Patients on immunosuppressive medications or systemic immunocompromising disorders
- 4- Diabetics with poor glycemic control
- 5- Extensive and invasive procedures are planned
- 6- Prior to surgical procedures in patients at risk for medication-related osteonecrosis

ABX ARE NOT GIVEN FRO DENTAL ABSCESS – THE MANAGEMENT OF ABSCESS IS I&D

Q: what ABX can I give if my pt requires them ?

- 1- **First choice = Amoxicillin**
- 2- **Augmentin** [amoxicillin + clavulunate]
- 3- **Co-amoxiclav** is active against **beta-lactamase-producing bacteria** that are resistant to amoxicillin, and **can be used to treat severe dental infection with spreading cellulitis or dental infection that has not responded to first treatment.**
CAUTION: Cholestatic jaundice can occur either during or shortly after the use of co-amoxiclav;
Do not prescribe co-amoxiclav to patients who have hepatic dysfunction
- 4- **Metronidazole** is effective against **anaerobic bacteria**. It can also be used as an adjunct to amoxicillin in patients with spreading infection or pyrexia.
Advise patient to avoid alcohol (metronidazole has a disulfiram-like reaction with alcohol).
Do not prescribe metronidazole for patients taking warfarin
- 5- **Second choice = Clindamycin** : for patients allergic to penicillin – excellent bone penetration
Side effect = pseudomembranous colitis
- 6- **Third choice = azithromycin / clarithromycin**

Pain management :

- A. **Non opiods:** acetaminophen (APAP) and the nonsteroidal anti-inflammatory drugs (NSAIDs)
Acetaminophen : The maximum recommended daily dose **of paracetamol (4 g for adults)** Overdose → hepatic damage.
NSAIDs: ibuprofen, naproxen, aspirin inhibit the COX-1 enzyme → can cause peptic ulcers
The maximum recommended daily dose of ibuprofen 2.4 g
- B. **Opioids:** acts as agonists at opioid receptors (mu and kappa receptors) while **naloxone acts as an antagonist.** [**used in case of overdose]**
No anti inflammatory effect
The most common adverse effect is constipation followed by , respiratory depression and orthostatic hypotension

Note: Cyclooxygenase [COX] is the enzyme which produces prostaglandins.

COX-1 enzyme produces prostaglandins in the GI Tract which protect against gastrointestinal ulcers.

COX-2 selective inhibitor like celecoxib (Celebrex) has less chance of causing ulcers



IMP: If the inferior alveolar, mental, or infraorbital nerves were violated iatrogenically during the surgical procedure, a **glucocorticoid** [steroid] may diminish the damage by keeping the inflammatory response to a minimum.

Suggested dose of steroid in case of nerve damage :

- **dexamethasone sodium phosphate 4 to 8 mg (IV) or (IM)**
- After the procedure, **a long-acting IM glucocorticoid, such as methylprednisolone acetate suspension**
20 to 60 mg via deep IM injection
 - > **Diazepam** is often considered the **prototypical benzodiazepine**
 - > In oral surgery, **5mg in the night before the surgery, 5 mg in the morning and 5mg 1 hour before the surgery.**

Pharmacological Pain Management

Non-opioid Analgesics (1-3 or mild pain)

Examples include: Acetaminophen and nonsteroidal antinflammatory drugs such as Ibuprofen.

Weak Opioid analgesics (4-6 or moderate pain) Example: Codeine

Strong Opioid analgesics (7 or above, severe pain)

Examples: Morphine, Dilaudid

Adjuvant Medications: Drugs with indications other than pain which may be analgesic in specific circumstances. Examples include: Decadron, antidepressants, anticonvulsants, Alpha-2-Adrenergic Agonists (Clonidine), muscle relaxants (Baclofen)



Biopsies

Biopsy = removing tissue for diagnostic purpose

Indication	Relative contraindication [no absolute contraindication]
<ol style="list-style-type: none"> 1- Lesions persisting for more than 2 weeks with no apparent etiology 2- Persistent hyperkeratosis 3- Lesions interfering with function [mastication + speech] 4- Bone lesions not identified by clinical or radiographic findings 5- Lesions having characteristics of malignancy 	<p>For all cases you need to stabilize the pt then take the biopsy</p> <ol style="list-style-type: none"> 1- Severe bleeding tendency or coagulopathies 2- <u>Injectable</u> bisphosphonates 3- Congenital heart defects 4- Poorly controlled diabetics 5- Immunocompromised patients

Q: why is the cut point for taking a biopsy for a persistent lesion is set at 2 weeks? Because lesions caused by trauma, inflammation , infection would mostly resolve by 2 weeks

Traumatic ulcers don't need biopsies – you remove the cause first if the lesion persists then you take a biopsy

Features that raise suspicion of malignancy:

- 1- Erythroplasia
- 2- Ulceration
- 3- Duration [short duration]
- 4- Growth rate [rapid growth rate]
- 5- Bleeding [specially on slight provocation]
- 6- Fixation to underlying tissue
- 7- Location [specially lateral border of the tongue and floor of the mouth]

Before taking a biopsy you need to have your differential diagnosis , if your DD includes malignancy do [incisional biopsy] if not and the lesion is small you can do [excisional biopsy]

NOTE:

- Before doing any surgery for any intrabony lesion you need to take a FNA to know if it is vascular or not.
- Final diagnosis is only by incisional / excisional biopsies
- BIOPSES SHOULD ALWAYS BE DONE WITH A SCALPEL – because you need to avoid necrotic tissue and cautery causes necrosis margins

Bisphosphonates are given to treat osteoporosis and to cancer patients to decrease their pain.

They inhibit osteoclastic activity and affect blood supply . Any surgery in a pt taking bisphosphonates will lead to bone necrosis. [more if the pt is taking injectable bisphosphonates]

Management of pts taking bisphosphonates:

You stop bisphosphonates 1 week before surgery and give ozone therapy then resume bisphosphonates 1 week after surgery



Types of biopsies

TYPE	NOTES
ORAL CYTOLOGY	<p>Best for screening to monitor large tissue areas for dysplastic changes</p> <p>Lesion is repeatedly scraped with a moistened tongue depressor, brush or spatula. The cells obtained are smeared on a glass slide and immediately fixed with a fixative spray or solution.</p> <p>NOT VERY RELIABLE – HAVE MANY FALSE +VE</p>
ASPIRATION BIOPSY	<p>You aspirate the lesion content using a needle and syringe - will only tell you if the lesion is benign or malignant but not final diagnosis</p> <p>Used for:</p> <ul style="list-style-type: none"> • All lesions thought to contain fluid • any intraosseous lesion before surgical exploration. • any fluctuant mass in the soft tissues to determine its contents <p>usually an 18 gauge needle is used – Fine needle aspiration uses 22 gauge needle</p>
INCISIONAL BIOPSY	<p>Takes only a representative part of the lesion</p> <p>Guidelines :</p> <ol style="list-style-type: none"> 1- Including tissue subjacent to the epithelium 2- Removing a wedge of manageable size 3- Minimal depth of 3 mm 4- Minimal length of 3-6 mm 5- Minimal width of 1-2 mm 6- Necrotic tissue should be avoided 7- Taken from the edge of the lesion to include normal tissue 8- Incisions should be parallel to vital structures 9- Include 2-3 mm margin of normal tissue [if the lesion appears malignant include 5 mm of normal tissue] <p>Indications:</p> <ol style="list-style-type: none"> 1- Extensive size (>1 cm in diameter) 2- Hazardous location [very close to vital structures] 3- A great suspicion of malignancy 4- Lesion has different characteristics at different locations [you take from the center + multiple from the edges] <p>Procedure:</p> <p>Mark the lesion [should be done before LA , because LA can hide the outline of the lesion] LA should be injected at least 1 cm away from the tissue to be removed if you are giving field block [because LA injected in the specimen can cause distortion]</p> <p>BEST = regional block</p> <p>An elliptical incision is made for biopsies [easy to reapproximate the edges] – biopsies in the attached gingiva or palate can be left to heal by secondary intension</p> <p>Intrabony lesions: reflect a muco periosteal flap → aspirate to know if the lesion is vascular → make a window in the bone using rotary instrument then remove tissue</p>
EXCISIONAL BIOPSY	<p>Remove the entire lesion + a margin of normal tissue (2-3 mm) [definitive treatment]</p> <p>Indications :</p> <p>Small lesions that are less than 1 cm in diameter and appear to be benign</p>



Q: what can you do if there is too much pressure inside the lesion and you cannot aspirate ? insert another needle to decrease the pressure and with the other needle aspirate the content

Specimen care

- Immediately placed in **10% formalin** solution that is at least **20 times the volume of surgical specimen**
- Specimen should be totally immersed in the solution - be sure that the tissue is not lodged on the wall of the container above the level of the formalin.

Biopsy form: should Include :

- 1- **Doctor information** [date, name, licence # , address]
- 2- **Pt information** [name , age , sex, race]
- 3- **Lesion clinical details** [size , shape , texture , location , lesion duration , growth rate + radiographical findings] – if you followed the pt over time include infor from different time intervals
- 4- **Differential diagnosis**
- 5- **Operative findings** [things that you saw during the biopsy taking like abnormal fluid, excessive bleeding, bone erosion etc]
- 6- **Post op diagnosis**

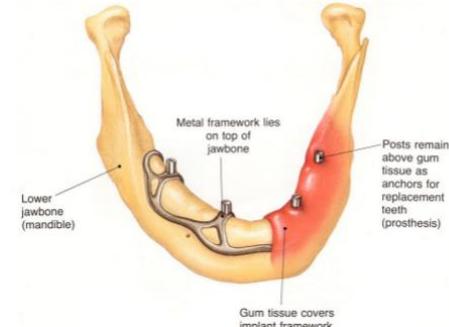
If you are not convinced with the result of the biopsy , take another one. [if the result does not match what you see clinically]



Dental implants

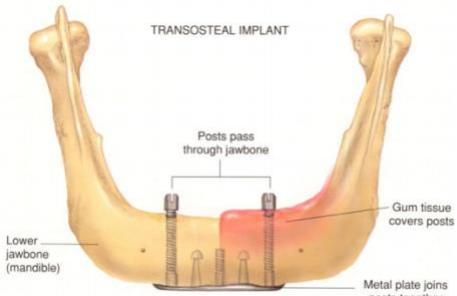
Subperiosteal implant:

- Requires double surgery , first you open a flap and take an impression for the metal framework – second surgery you reopen the flap , place the framework and suture.
- The metal framework is above bone [under the periosteum]
 - DISADV: lack of stability [stability can be improved by taking a CBCT and constructing the framework using CAD/CAM]



Transosteal implants:

- **Used in cases of severe bone atrophy**
- The implant goes through the bone from one side to the other
- A metal plate connects the implants together – but access to place the plate is done by an extra oral flap → scarring
 - DISADV:
very invasive [because it goes through and through]
weakens the mandible
the extra oral flap that is used to insert the plate → leads to scarring



Branemark protocol for dental implants:

- a- Atraumatic surgery
- b- Non loading period of 3-6 months
- c- Use of compatible material [titanium]

The safest area for implants in the inter foraminal area [the area in the anterior mandible between the two mental foramen] – this area has only minor bvs and nerves

Atraumatic surgery :

- In soft tissue handling – avoid periosteal striping and reflection + avoid over heating the bone [heat above 47° C will cause irreversible bone necrosis]

Heat is reduced by :

- A. Hand piece torque [the drill does not stop]
- B. Use sharp burs and replace them every 20 surgeries
- C. Chilled irrigation [place irrigants in the fridge before using]
- D. Intermittent pressure
- E. Speed should be between 600-800 RPM

Teeth have JE + CT + PDL + sharpey's fibers

Implants only have JE

Non loading period : the crown is not placed immediately over the implants [you need to wait 3 months in the mandible and 6 months in the maxilla]



Osseointegration: direct structural and functional connection between the implants and the bone. [**hemidesmosomes like structures**, no CT insertion , no sharpey's fibers] – the first cell to contact the implant is osteoblast

Q: what is the difference between implants and natural teeth ?

- 1- Hypocellular (less healing capacity)
- 2- Hypovascular (bleeding is less reliable sign of inflammation)
- 3- No shock absorption (no adaptive)
- 4- Connective tissue parallel to implant
- 5- No innervation & no proprioception
- 6- Fulcrum when lateral force applied (**Tooth=Apical, Implant=Crestal**)
- 7- Axial mobility of implant = **3-5 Microns** – axial mobility of the tooth = 25-100 microns
- 8- Probing depth is more in implants but it is a less reliable measure

It's normal to have up to 2 mm of bone resorption around the neck of the implant in the first year

Implants only have periosteal blood supply

Since implants do not have CT [no shock absorption] – if there with traumatic occlusion or excessive force it will lead to bone resorption [cervically] or the implant might mechanically fail

Q: why is it essential to check occlusion before implants ? because

they don't have innervation [no proprioception] and the pt wont be able to tell if there is a high spot or traumatic occlusion + excessive loads on the implant will lead to bone resorption

Q: why does bone resorption occur around the neck of the implant

? because during axial loading the fulcrum of the force on the implant is located crestally

Polymers = biotolerable [can be accepted or rejected]

Ceramic = bioactive

Titanium = biocompatible

Q: why does inflammation progress rapidly in an implant? Because the collagen fibers are oriented parallel to the implant [vertically] – while in natural teeth collagen fibers are oriented horizontally (the direction of the collagen fibers determines the spread of the inflammation)

Q: why are most implants made from titanium ?

- 1- Light weight
- 2- Corrosion resistant [oxide layer]
- 3- Strong and cheap
- 4- Biocompatible

Original branemark implants were machined screw form

Sinus lifting needed for implants can be:

- A. Crestal approach [if you only need to lift the sinus by 2-3 mm]
- B. Lateral window approach [if you need more than 3 mm]





Components of implants:

- 1- **Fixture [the body of the implant]**
- 2- **Cover screw** = prevents the ST from going inside the fixture space
Should be FLAT and SMALL [if it is high it will cause wound dehiscence]
If there is any gap between the fixture and the screw → bacteria will go inside and cause inflammation and bone resorption
The fixture and the cover screw are placed for 3 months in the mandible and 6 months in the maxilla
- 3- **Healing cap** = is placed for 3-4 weeks to create the emergence profile [the ST cuff around the implant]
The shape and height of the healing cap depends on the type of tooth that you are replacing [Ex: molars have wider healing caps]
- 4- **Abutment** = placed inside the fixture – can be stock or custom made
Some problems during implant placement can be corrected by abutment placement
Angled abutments are used in areas of unfavourable bone or in the anterior region [esthetic zone]
- 5- **Transfer coping**
- 6- **Analogue**

Parts of implant



There are three primary types of root form body:

- 1- Cylinder
- 2- **Taper or conical (indicated for Immediate insertion)**
- 3- Combination

- Immediate implant = you place the implant immediately after extraction
- Immediate loading = you place the implant and the crown immediately after extraction
- 3 months after extraction you'll have woven bone only , 6 months after extraction you' ll have lamellar bone

NOTE: if the implant's neck is smooth this will allow proper gingival attachment , if the neck is exposed over time the smooth surface will prevent microbial attachment

NOTE: you place tapered implants in the anterior maxilla - canine region [if you place cylindrical implants → fenestration apically due to the canine fossa]

The fixture and the cover screw are placed for 3 months in the mandible and 6 months in the maxilla , then the healing cap is placed for 3-4 weeks → take impression

Maximum bone resorption occurs in the first year due to surgery , trauma, occlusion

Resorption in the first year = 2 mm [around the neck] then 0.2 mm every year

**Bone level implant**

- Better emergence profile
- At the bone level
- Bacterial accumulation occurs at the level of fixture / abutment junction → inflammation + bone resorption

Soft tissue level implant

- Poor emergence profile [not used in esthetic areas]
- At gingival level [If there is recession → implant exposure]
- Bacterial accumulation is at the level of gum [above the bone] → less inflammation and less bone resorption

Does not need a second surgery

Immediate implant requirements:

- 1- No infection
- 2- Enough buccal plate [min 1.5 mm]
- 3- Enough bone apically [min 2 mm] – you need to drill in native bone to have good primary stability

Platform switching implants = the abutment is smaller than the fixture → collagen comes horizontally at the neck region → less inflammation and less bone loss



Q: how can you increase primary stability ?

- 1- the hole should be smaller than the implant
- 2- Decrease thread pitch + deep threads
- 3- Large diameter implant
- 4- Bone condensation by tapping [bone in the maxilla is soft , you can just do a pilot hole and then insert the implant by tapping

Thread pitch = the distance between the threads , if you decrease the thread pitch → better primary stability

- Excess helical angles of the threads will allows FASTER insertion but will reduce the implant's ability to withstand axial loading

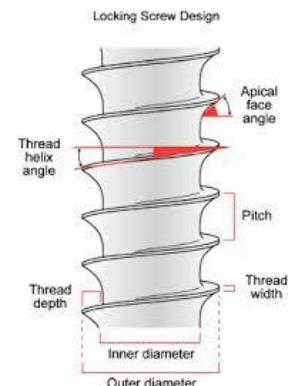
Instruments:



Osteotome [concave surface] – used for sinus lifting



Bone expander [convex surface] – expand the bone after pilot holes



Ideal implant length = 12 mm

Conventional diameter = 5-6 mm

Long zygomatic implants are used in cases of severe maxillary atrophy



- Both osteotome and bone expander are activated by mallet

Q: how do you choose the diameter of the implant ? based on the width of the cervical portion of the tooth being replaced

Benefits of large diameter implants:

- 1- Better emergence profile
- 2- Better mechanical strength & Force distribution
- 3- Less marginal bone resorption

Wider diameter implants provide better emergence profile

If the diameter is smaller than needed → the emergence profile is affected

If the diameter is larger than needed → the adjacent teeth are affected

Disadvantages of mini implants :

- 1- Lack of prosthetic options / designs
- 2- Narrow diameter → poor emergence profile + more cantilever effect

Contraindications of Dental implants:

Absolute contraindication	Relative contraindication
1- End stage cancer	1- Recent MI [within the last 6 months]
2- Radiotherapy	2- Poor oral hygiene
3- IV Bisphosphonate	3- Smoking
4- severe uncontrolled diabetic	4- Oral bisphosphonate
5- Hemophilia [contraindicated to give IAN block]	5- Uncontrolled periodontal disease
6- Steroid (Osteodystrophy)	



Implant measurements:

Bone thickness:

- Minimum thickness of the ridge should be 7 mm
 - 1.5 mm buccal plate
 - 1.5 mm lingual plate
 - 4 mm [minimum implant diameter]
- Bone thickness is measured by CBCT [invasive] or osteometer [non invasive]

Non invasive way to measure ridge thickness by using osteometer



Implant height: based on the distance from vital structures on the radiograph

Q: what is the difference between primary and secondary implant stability?

- Primary stability = stability achieved immediately after implant placement due to engagement with the cortical bone
- Secondary stability = stability achieved due to bone regeneration and remodelling after implant placement [but it is affected by the primary stability]





The time of functional loading is dependent upon the **secondary stability**

Flap for dental implants principles:

- All flaps in implants are mucoperiosteal flaps
- Periosteum needs to be preserved as much as possible [because it is the major blood supply to the bone]
- Whether you choose papilla preservation flap or including the papilla depends on the MD width of the residual socket.
 - A. Implant sites that are 8 mm and larger mesiodistally → Papillary preservative flap
 - B. less than or equal to 7 mm mesiodistally → need to reflect the papillae
- When graft materials or membranes are used → place relieving incisions at least at one tooth, proximal to the area of augmentation



The most common surgical complication of implants → traumatic surgical technique

The most common prosthetic complication of implants → screw loosening

Nerves and their relation to dental implants :

- Some dental drills have stoppers to ensure you don't over drill and hit the IDC
- **The most common emergence pattern of the mental foramen = posteriorly**
- The anterior loop of the mental nerve = an extension of the inferior alveolar nerve, anterior to the mental foramen, prior to exiting the canal.

The implant should be at least 2 mm away from the inferior dental canal or 5 mm anterior to the mental foramen



NOTE: in elderly the submandibular fossa becomes more prominent due to bone resorption → higher chance of perforating the sub mandibular fossa and injuring the facial artery + sub mandibular gland

Sublingual hematoma might result if you accidentally perforate the lingual cortex in the interforaminal area.

The only adjective method to determine the type of bone is CBCT

- **Most dense bone = anterior mandible**
- **Least dense bone = posterior maxilla**

Q: what is compression necrosis? If the primary stability exceeds 60-80 N/cm [very high primary stability will lead to compression necrosis]

Surface characteristics of dental implants:

- **Rough surface provide shorter implant healing time and earlier loading** [rough surface will increase the surface area → more bone engagement → cells will be induced to differentiate quickly → shorter healing and faster osteointegration]

Dental implant ratchet – used to measure primary implant stability



- Fibroblasts prefer **smooth surfaces**
- Macrophages, epithelial cells, osteoblasts prefer to attach to **rough surfaces**

Ideal porosity for osseointegration = 5 μm

Examples of Dental implant surface modifications:

- 1- Calcium phosphate coating
- 2- Titanium plasma spray
- 3- Electropolishing
- 4- Mechanical polishing

Implant insertion		
Immediate	Early	Delayed
Non-esthetic areas	Esthetic areas	≥ 6 months after extraction
4 extraction walls remaining	6-8 weeks after extraction	

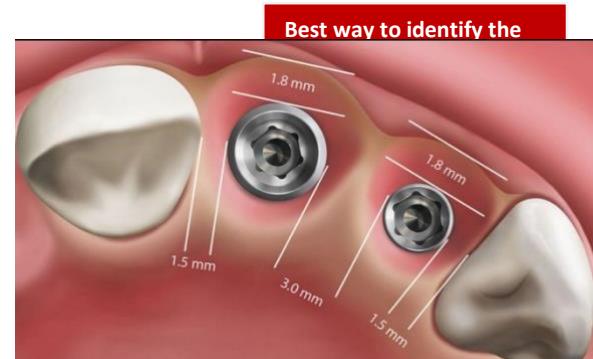
Immediate implants are NOT placed in esthetics regions because you cannot predict the ST response

Clinical or Absolute Failure

- 1- pain on function
- 2- radiographic bone loss $>\frac{1}{2}$ length of implant
- 3- uncontrolled exudation
- 4- implant is no longer in mouth

implants dimensions summary:

- Distance between 2 implants=3mm
- Distance between implant and natural tooth=1.5mm
- Ideal thickness of buccal and palatal bone plant=1.5mm
- Implant length = determined by the distance from vital structures [ideal = 12mm]
 - [implant should be 2 mm away from IDC and 5 mm anterior to the mental foramen]
- Implant diameter = depend son the MD width of the tooth being replaced [minimum = 4 mm , conventional diameter = 5-6 mm]



Q: at a center of a 4 mm diameter implant , what should be the distance between this implant and another implant? 7 mm [2 mm from the first half of the implant , 3 mm inter implant distance , 2 mm from the second half of the other implant]





Preprosthetic surgeries

Preventive procedures: [things that can be done to limit the need for further pre prosthetic surgeries]

At time of tooth extraction:

- 1- Avoid tearing of soft tissue [because teared tissues heal by scarring which is not favorable under a denture]
- 2- Compression of the socket [if the socket is enlarged]
- 3- Remove remaining roots, cysts.

- A. **Alveolectomy** = surgical removal of the alveolar process , done before radiation therapy and in cases of severe overjet
- B. **Alveolotomy** = surgical removal of inter-radicular bone, to allow re-modeling and contouring
Usually done after multiple extractions where the ridge becomes irregular → remove the inter radicular bone and apply digital pressure to put the buccal and lingual plates back in the right configuration
- C. **Alveoplasty** = removing all sharp edges and rough projections

Double Y Incision is used for torus palatinus removal

Corrective procedures – bony abnormalities:

- 1- Torus palatinus removal [bony exostoses in the midline of the palate]
- 2- Torus mandibularis [bony exostosis in the lingual side of the canine – premolar region]
Doesn't always require removal , it is removed if it is causing pain , ulceration or difficulty in wearing the denture
- 3- Enlargement of the maxillary tuberosity [might be fibrous or bony]
- 4- Sharp mylohyoid ridge (lingual balcony): becomes prominent due to advanced bone resorption , must be removed if it interferes with the denture or causes pain and discomfort.



NOTE: the mylohyoid muscle has to be sutured to the nearest soft tissue to be functional again

- 5- Knife edge ridge → you can either trim the ridge [which will reduce the height or ideally do bone grafting]
- 6- Inadequate vertical space → remove bone from the opposing ridge to allow more vertical space
- 7- Prominent mentalis tubercles → reduce them + suture the mentalis muscle to the nearest soft tissue
- 8- prominent genial tubercles → excise only the upper part of the bony prominence



Q: why should you reduce enlarged maxillary tuberosities? Because it may have deep undercuts which interfere with the fit of upper denture or may impinge on the coronoid process with buccal flange of the denture leading to its dislodgement.

Q: why in prominent genial tubercles you should only remove the upper part? Because the geniohyoid and genioglossus muscles are attached to the lower end of the genial tubercles

Corrective procedures – soft tissue abnormalities:

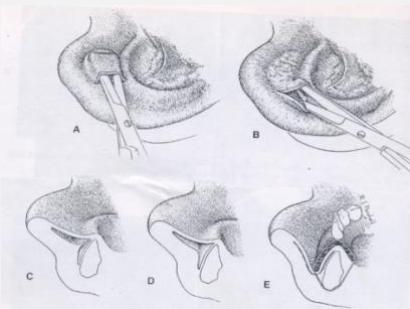
- 1- **mobile fibrous maxillary tuberosity enlargement** → elliptical V-shaped wedge incision → removal of the fibrous tissue
- 2- **short labial frenum** → frenectomy
- 3- **ankyloglossia [tongue tie]** → frenectomy
- 4- **epulis fissuratum / denture granuloma**
- 5- **flabby ridge**
- 6- **muscle attachments [scar bands] – they do not contain muscles** - lacerations that occur during extractions and heal by scar tissues [interfere with buccal extensions of the denture] → should be surgically removed
- 7- **shallow sulcus** → relative or absolute heightening procedures

Complications associated with tongue tie [ankyloglossia]:

- 1- Inability to protrude the tongue
- 2- Inability to clean away food
- 3- Speech difficulties
- 4- Displacement of the lower denture
- 5- Irregularities of the lower anterior teeth

NOTE: Most Preprosthetic surgeries use elliptical incisions because it is the easiest to re approximate the edges

Relative heightening procedures	Absolute heightening procedures
[bone height is okay , there is no resorption – the decrease in the vestibular depth is due to the attachment of the muco periosteum at a high level on the alveolar ridge] Indicated only if adequate underlying bone is present and contraindicated in severe ridge resorption	Used in cases of bone resorption
<ol style="list-style-type: none"> 1. Submucosal vestibuloplasty 2. Secondary epithelialization vestibuloplasty 3. Grafting vestibuloplasty 4. Fenestrated mucosal flap vestibuloplasty 	<ol style="list-style-type: none"> 1. Mandibular augmentation 2. Maxillary augmentation

**TECHNIQUE****SUBMUCOSAL VESTIBULOPLASTY****DESCRIPTION**

Indicated when adequate underlying bone is present

The mucosal tissue **must be healthy + must not be scarred or show surface hyperplasia**

2 incisions at the canine region in the mucobuccal fold → tissue dissection with hemostats / scissors → since the mucosa is now free of attachments → push it down and suture

An acrylic splint is placed to maintain the sutures in place until healing is done

SECONDARY EPITHELIALIZATION VESTIBULOPLASTY

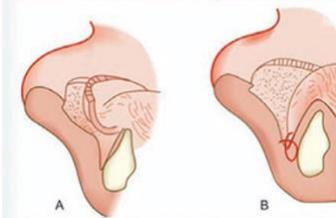
Indicated when sufficient bone is present **but the mucosa is either insufficient in quantity or of poor quality.**

Two main techniques: [the difference is the location of the incision]

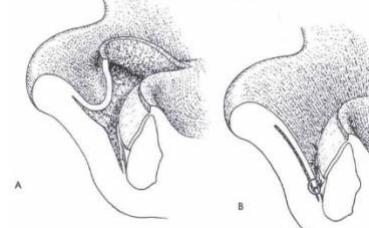
- A. **Kazanjian's technique** → labial flap to line the osseous side of the deepened vestibule
- B. **Obwegeser's technique** → flap of alveolar mucosa to line the soft tissue side of the vestibule.

DISADV: both techniques leave a raw area to heal by secondary intention

KAZANJIAN'S TECHNIQUE



OBWEGESER'S TECHNIQUE

**GRAFTING VESTIBULOPLASTY**

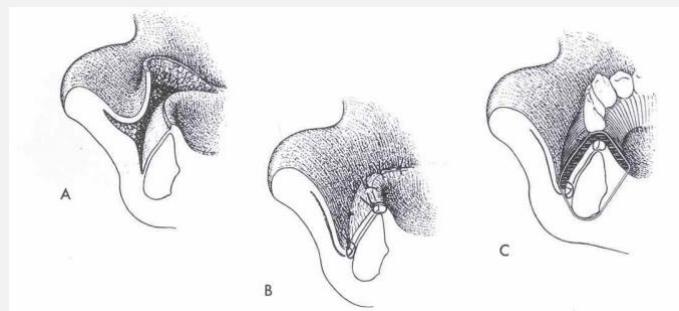
free graft is used to line the raw periosteum.

Relapse caused by wound margin contracture is less if the raw area is grafted

An acrylic splint is used to maintain the sutures in place

ADV: covering the surgical defect decreases patient discomfort and allow rapid healing

DIADV: it subjects the pt to another surgery , somewhere else in the body + there is a chance of rejection



**FENESTRATED MUCOSAL FLAP
VESTIBULOPLASTY**

Indicated when you don't want to leave a raw area to heal by secondary intention and you don't want to subject the pt to another surgery for graft collection

2 flaps are made : one on the mucosa of the lip/ cheek and one on the alveolar mucosa → the alveolar mucosa flap is fenestrated by 4-5 oblique full-thickness incisions, stretched to cover most of the labial raw periosteum, and fixed on it.

Mandibular augmentation	Maxillary augmentation
1- Superior border augmentation	1- Superior border augmentation
2- Inferior border augmentation	2- HA augmentation
3- HA augmentation	3- Pedicle / interpositional grafts
4- Pedicle / interpositional grafts	4- Sinus lifting



Maxillary sinus dental implications

All paranasal sinuses are lined with resp epithelium = pseudostratified ciliated columnar epithelium

The maxillary sinus is the first to develop and it's growth ends with the eruption of the 3rd molars [around 20 yo]

Q: what is the dental implication of having the Posterior superior alveolar nerve passing through the posterior surface of the max sinus? Sinusitis can lead to referred pain in the upper posterior teeth

Q: orbital floor fractures can be accessed through the maxillary sinus by ? cadwell luc approach

The maxillary sinus secretions are drained **through the ostium** into the nasal cavity. The ostium is located in the medial wall of the sinus at the level of the **middle nasal meatus**

Q: the ostium has unfavourable position for drainage , how do secretion drain into the middle nasal turbinate? By the action of the cilia that push the secretions upward into the ostium

Q: what causes the fluid accumulation in case of sinusitis? The cilia stop working and are unable to push the secretions through the ostium for drainage → fluid accumulation

Max sinus :

Height = 3.5 cm depth = 3.2 cm width = 2.5 cm capacity = 15 cc

Nasal antrostomy : using a curved hemostat to create a hole through the nose at the level of the inferior nasal turbinate to facilitate max sinus drainage OR puncture a maxillary mucocele to decrease its size and facilitate its removal

The maxillary sinus is divided into multiple tiny compartments by thin bony septa called **underwood's septa** [cannot be seen on xray because they are very fine]

Pneumatization of maxillary sinus: enlargement of the max sinus due to the resorption of the alveolar bone



Q: What might be the clinical implications of maxillary sinus pneumatization ??

- 1- Fracture of the max sinus wall during extraction of adjacent teeth
- 2- Not enough bone to place implants
- 3- Roots of adjacent teeth can easily be displaced into max sinus
- 4- Higher chance of OAC during extraction of adjacent teeth
- 5- Dental infections can easily affect the maxillary sinus and vice versa

Q: which tooth is closest to the maxillary sinus? Distobuccal root of max 2nd molar

Q: which tooth is farthest from the sinus ? max 1st PM

Functions of the paranasal sinuses :

- 1- Humidifying and warming inspired air



- 2- Regulation of intranasal pressure
- 3- Increasing surface area for olfaction
- 4- Lightening the skull
- 5- Resonance
- 6- Absorbing shock

Maxillary sinus diagnostic aids:

- Transillumination carried in a **dark room** with **low voltage lamp**
- You apply the light extra orally and ask the pt to open their mouth – look for the light intraorally [in case of inflammation the fluid inside the maxillary sinus will block the light and you wont be able to see the light intra orally]



Acute sinusitis : Suppurative or non suppurative inflammation of the mucosal lining of the sinus.

Causes :

- 1- Secondary to hay fever and allergic rhinitis.
- 2- Secondary to acute rhinitis (common cold) and URT infection.
- 3- Bacterial infection due to: dental sepsis, swimming and diving, trauma and foreign body dislodgment

Q: what is the most characteristic sign of sinusitis? Heavy filling with bending

Signs and symptoms

- Headache
- Pain and tenderness.
- Nasal obstruction. + Nasal discharge.
- **Heavy filling with bending.**

Management :

- 1- Rest + fluids + mouth hygiene.
- 2- Antibiotics; **pneumococci and streptococci are the most causative organisms.**
- 3- Analgesics and **antihistamines.**
- 4- Local treatment (decongestant and steam inhalation)

Chronic sinusitis: can lead to sinus polyps

Causes :

- 1- As a consequence of non resolved acute sinusitis.
- 2- Dental abscesses.
- 3- Virulent organism with low resistance.
- 4- Foreign body dislodgement or trauma.

Same signs as acute sinusitis

Treatment:

- Antibiotics.
- Systemic decongestants.
- Sinus wash-out. [with saline to remove inflammatory mediators]



Sinus lifting: a surgical procedure to increase the amount of bone in the posterior maxilla before placing implants – bone grafts can be :

- 1- Autogenous [from mandibular symphysis , or zygomatic buttress or iliac crest]
- 2- Frozen bone or freeze dried bone
- 3- Synthetic material [hydroxy appetite]

Q: How can sinus lifting affect a patient with chronic sinusitis ?? it will improve chronic sinusitis by pushing the floor of the maxillary sinus upward bringing it closer to the ostium for better drainage

If the sinus lining is pierced during sinus lifting → don't attempt to repair it

Maxillary sinus mucocele : dome shaped radioopacity in the max sinus

- 1- Could be left untreated
- 2- Cannulation through inferior turbinate puncture [nasal antrostomy]
- 3- Marsupilization [if the mucocele is too big]
- 4- Enucleation through Caldwell-Luc

- In all Le fort fractures the maxillary sinus is involved .
- Fracture of the maxillary tuberosity means fracture of one of the walls of the max sinus



The temporomandibular joint TMJ

TMJ :

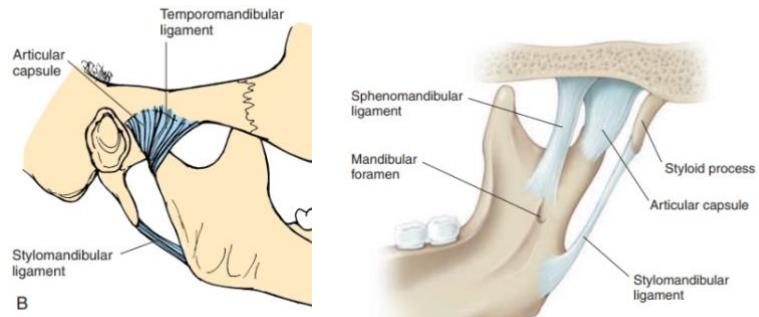
- Articular surfaces are covered by **fibrocartilage** not hyaline cartilage
- Fibrocartilage of the TMJ = the growth center for the mandible
- The mandibular condyle articulates with 2 parts of the temporal bone [the glenoid fossa and the articular eminence]
- Mandibular condyle is wider **mediolaterally**

Q: which anatomical structure contacts the upper surface of the TMJ disc? The articular fossa [temporal bone]

Q: which anatomical structure contacts the lower surface of the TMJ disc ? the condyle of the mandible

TMJ ligaments: [are there to limit movements and define TMJ border movements]

- **Major ligament:**
temporomandibular ligament [thickened lateral portion of the capsule , has 2 parts – outer oblique portion and inner horizontal portion]
- **Minor ligaments :**
 - A. **Stylomandibular**
 - B. **Sphenomandibular**



Synovial fluid : a derivative of plasma and contains **low-molecular weight molecules** [The level of these molecules varies depending on the degree of inflammation in the joint]

- Total protein in normal synovial fluid is approximately **1.5 to 1.8 g/dl**. In the **inflamed state**, this level increases [to check inflammation in the TMJ → take synovial fluid aspirate]
- Lubrication is provided by high molecular weight molecules [the most important one is **hyaluronic acid**] – hyaluronic acid injections are used in the treatment of arthritis
- In pts with clicking or crepitus → high molecular weight molecules are broken down to low molecular weight molecules → less lubrication

Articular disc = fibrous extension of the capsule - **biconcave** and attaches to the condyle medially and laterally

Q: what are the extensions of the disc capsule? The temporomandibular ligament and the articular disc

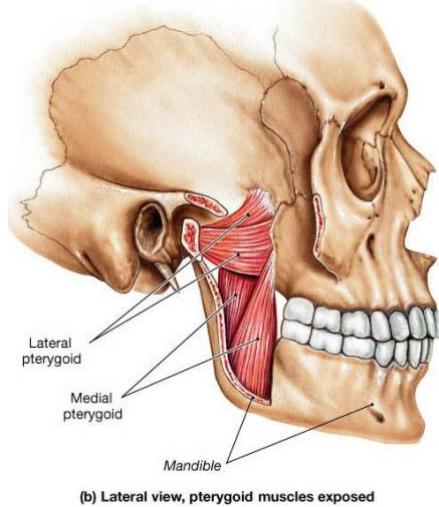
Only the **posterior attachment** of the disc is innervated



Q: the natural articular disc shape ? biconcave

Q: natural joint movement? Anterior gliding followed by hinge like rotation

TMJ movement happens due to the action of the 4 muscles of mastication + the supra and infrahyoid muscles



The two main TMJ movements are :

Anterior gliding in the upper compartment and rotation in the lower compartment

Normal mouth opening → only anterior gliding

Maximum mouth opening → hinge rotation

" it takes one muscle to open your mouth but it takes 3 muscles to close your mouth"

Muscles of mastication [all innervated by V3]		
Muscle	Insertion	Action
Lateral pterygoid	Upper head inserts in the articular disc Lower head inserts into the condyle	Pulls the disc and the condyle forward and downward → opens the mouth
Medial pterygoid	Medial border of the angle of the mandible	Pull the angle of the mandible → close the mouth
Masseter	Lateral border of the ramus	Pull the angle of the mandible → close the mouth
Temporalis	The coronoid process	Pull the coronoid process → close the mouth



Temporomandibular joint disorders TMD

Internal derangement of the TMJ :

- Abnormal positional + functional relationship of TMJ components
- Most common disorder affecting TMJ
- Mostly in females

Etiology of internal derangement :

- 1- Trauma
- 2- Parafunctional habits [bruxism and clenching]
- 3- Joint laxity
- 4- Muscle spasm
- 5- Increased friction

The most common position of disc displacement = anteriorly

In all TMJ disorders the mandible deviates towards the affected side

Q: why does the articular disc displace anteriorly in pts who clench? During clenching all of the muscle of mastication are contracting but the upper head of the lateral pterygoid muscle is attached to the disc itself → so when it contracts it will pull the disc anteriorly

Disc displacement

Disc displacement with reduction	Disc displacement without reduction
In closing the disc is displaced anteriorly but when the pt opens their mouth the disc reduces back to its normal position	In the closing and opening the disc remains anteriorly – often results from untreated disc displacement with reduction “ pt will tell you I used to have clicking but then it went away and I can't open my mouth now ”
Pain Clicking ** [single, short duration] Catching sensation during mouth opening Deviation of mandible on opening [towards the affected side] **	Pain Crepitus ** [long duration] Limited mouth opening Normal eccentric movement to the ipsilateral side but Restricted eccentric movement to the contralateral side

Q: why does disc displacement cause pain even though the disc is not innervated? The only part of the disc that is innervated is the posterior attachment [innervated by the auriculotemporal nerve] – when the disc is displaced anteriorly the attachment will be in b/w bone → pain

Q: what causes the clicking sounds in disc displacement with reduction? Since the disc is displaced anteriorly then there will not be any space for the disc to move causing it to pop out sometimes from in between the bones → clicking sound



Q: what causes the crepitus sound in disc displacement with out reduction? The bones grinding against each other during movement

Q: when do you hear TMJ clicking and why? Clicking is heard in anterior disc displacement with reduction when the pt opens their mouth

Diagnosing TMJ disorders:

1- History:

Ask about parafunctional habits like clenching , previous dental visits where they had to open their mouth for along time and any previous trauma

2- Physical exam

- Palpate the muscles of mastication + the TMJ [placing your fingers anterior to the tragus of the ear]
You ask the pt to open and close 5 times , then move laterally for 5 times , then protrude and retrude 5 times [you need to hear the abnormal sound at least 3 times out of the 5 times to consider it as clicking or crepitus]
- measure pain using visual analog scale
- measure assisted and unassisted interincisal distance

Normal mouth opening = 35 – 50 mm

Less than 35 mm → restricted opening

More than 50 mm → hypermobility

3- MRI – at later stages a CT can be used to show bone changes

MRI should be taken in open mouth and closed mouth position [you check the closed mouth image first]

When checking the MRI if the disc is displaced anteriorly during closure you won't be able to know if the displacement is with or without reduction unless you check the image during opening . if it is reduced back to its normal position → with reduction . if it remains anteriorly → without

Treatment of internal derangement:

1- Extra joint therapy

- splint therapy
- therapeutic manipulation [forcefully opening the mouth under GA to release the adhesions]
- Physical therapy
- Drug therapy

2- Intra joint therapy [surgical treatment , arthroscopy, arthrocentesis]

Arthrocentesis: irrigating the **upper compartment of the TMJ** with ringer's lactate and pressure to widen the narrowed joint space and release adhesions and inflammatory mediators → used in treatment of limited mouth opening due to internal derangement

Arthrocentesis benefits :

- A. It reduces pain by removing inflammatory mediators
- B. Increases mouth opening by widening the joint space
- C. Increasing joint mobility by releasing adhesions + the lubrication effect of the hyaluronic acid



Arthroscopy and arthrocentesis produce similar results and follow the same concept of removing inflammatory mediators and adhesions , the only difference is the ability to see the joint space during arthroscopy and sometimes you can insert a small shaver to remove adhesions

Myofacial pain dysfunction syndrome: [MPD]

- Caused by **overwork, fatigue or tension of the jaw and other muscles in the head and neck mostly due to bruxism and stress**

Symptoms:

- 1- **Headache** [becomes worse when the pt opens and closes and when they are exposed to cold weather]
- 2- **Ear pain** [not associated with infection so there will not be hearing loss or discharge]
- 3- **Dizziness [vertigo]**
- 4- **Tinnitus** [ringing in the ear]

Q: why does MPD cause ear pain? Because the TMJ and the ear are innervated by the same nerve – auriculotemporal nerve

Clinical exam for MPD:

- 1- Compare both sides of the jaw, face and head for symmetry [MPD can cause masseter muscle hypertrophy]
- 2- Palpate the TMJs, jaw bones and head and neck muscles to find painful areas
Masseter and temporalis → extraoral palpation
Lateral pterygoid → intraoral palpation
Medial pterygoid → extra oral palpation , below the angle of the mandible
- 3- Look for jaw deviation on opening + Listen for joint noises
- 4- Measure mouth opening and check side-to-side movements [normal range of movement = 3.5 cm mouth opening and 1 cm protrusion and lateral movement]

Clinical signs of MPD:

- 1- Limitation of jaw opening
- 2- spasm of facial muscles
- 3- Clicking or popping / crepitus sound in the TMJ + Tenderness on palpation of the TMJ
- 4- Lateral deviation of the mandible.

Treatment of MPD:

Phase 1 therapy [upon diagnosis]	Pt education + avoiding clenching + soft diet NSAIDs +/- muscle relaxants Moist heat therapy + stretch massages [most pts will have significant relief in 2-4 weeks]
Phase 2 therapy [if phase 1 fails]	Continue medications + add occlusal splint [to be worn at night and some time during the day if needed – the pt MUST NOT wear it a lot because it can cause posterior teeth displacement] – discontinue the splint if the pt becomes asymptomatic
Phase 3	Physiotherapy [pulsed radio frequency energy therapy – PRFE]
Phase 4	Psychological counselling + trigger point injections Botox injections [causes facial paralysis + if injected wrongly can cause problems]



**Disc displacement with reduction [if not treated will become] → disc displacement without reduction
→ arthritis → ankylosis**

Degenerative arthritis

- Causes: aging ,trauma and secondary from other joint disease
- Clinically: pain + clicking or crepitus + limited mouth opening
- Anatomical findings:
 - A. **Disk:** irregular, perforated ,severely damaged
 - B. **Articular surface:** flattening ,erosions,**osteophyte formation [bony protuberance that forms as a result of TMJ inflammation]**

Systemic arthritis : TMJ arthritis associated with rheumatoid arthritis [if the pt is not yet diagnosed with rheumatoid arthritis → ask them if they have pain in other joints (specially small joints like hands and wrists)]

Juvenile rheumatoid arthritis with TMJ involvement → can result in destruction of the condylar growth plate → mand growth stops → class II malocclusion

Ankylosis: Inability to open the mouth beyond 5mm of inter-incisal opening.

- A. False ankylosis – structures outside the TMJ involved
- B. True ankylosis – when the disease involves the TMJ itself
 - When inflammation causes the joint-ends of the bones to fuse together → “ osseous” or complete ankylosis.

CLASSIFICATION OF ANKYLOSIS:

1. False ankylosis or true ankylosis.
2. Extra - articular or intra - articular.
3. Fibrous or bony.
4. Unilateral or bilateral.
5. Partial or complete

Causes of false ankylosis:

- 1- muscular trismus [due to odontogenic infections / pericoronitis etc.]
- 2- muscular fibrosis [due to arthritis or myositis]
- 3- myositis ossificans [trauma causing hematoma that is not treated and undergoes ossification]
- 4- tetany [caused by hypocalcemia]
- 5- tetanus [infection caused by clostridium tetani – has early symptom of lock jaw]
- 6- neurogenic causes [epilepsy and brain tumors that cause hypomobility of the jaws]
- 7- trismus hystericus
- 8- drug induced spasm
- 9- mechanical blockage [elongation of the coronoid process]
- 10- fracture of the zygomatic arch with inward buckling
- 11- fracture of the mandible [reflex spasm will cause trismus and ankylosis]
- 12- burns and scars of the face



13- cleft palate operations [will cause fibrosis of pterygomandibular raphe → limited mouth opening]

14- submucous fibrosis

causes of true ankylosis:

- 1- birth trauma [due to delivery using forceps]
- 2- Haemarthrosis [fracture of the base of skull extending through the mandibular fossa or an intracapsular injury]
- 3- Suppurative arthritis
- 4- Rheumatoid arthritis
- 5- Osteomyelitis
- 6- Fracture of the condyle [Trauma to the condyle in children is more likely to cause ankylosis than adults]

Q: why do intracapsular fractures happen more in children? Because the condyle in children is bulky , so trauma will not fracture the condylar neck and will cause intracapsular fracture → higher risk of TMJ ankylosis . In adults , trauma to the condyle will lead to condylar neck fracture away from the joint because the neck is thinner.

IMP NOTE:

- **Trauma in children leads to intracapsular fractures** [because the condylar neck is bulky] → hematoma that forms will later have bone formation + ankylosis
- **Trauma in adults leads to condylar neck fractures** [because the condylar neck is thinner] → fracture is away from the TMJ → no ankylosis
- **Early joint involvement** [less than 15 years] → Severe facial deformity and loss of function [because of damage to the growth center in the cartilage]
- **Later joint involvement** [after the age of 15 years] → loss of function with little or no facial deformity
- **Patients in whom the ankylosis develops after full growth completion have no facial deformity**

Clinical features of ankylosis :

- 1- **Pain is not an outstanding symptom**, it is present only in the early stages of the disease
- 2- Healed chin laceration **
- 3- Reduced interincisal mouth opening or NO mouth opening at all + neglected oral hygiene + Inability to masticate food

Q: most pts with TMJ ankylosis have? healed chin lacerations



Bilateral ankylosis

- 1- Bird face deformity + micrognathic mandible [trauma causes the mandible to stop growing]
- 2- Class II malocclusion **
- 3- Deep antegonal notching [bilateral] **
- 4- Severe crowding + anterior open bite + protrusive upper anterior teeth



Unilateral ankylosis

- 1- Facial asymmetry with affected side appearing normal & the opposite side appearing flat + chin is deviated to the ankylosed side [This is because the normal side continues to grow & pushes the mandible to the affected side giving appearance of fullness on the ankylosed side.]
- 2- Ante-gonal notch on the affected side
- 3- Class II malocclusion on affected side and cross bite may be seen

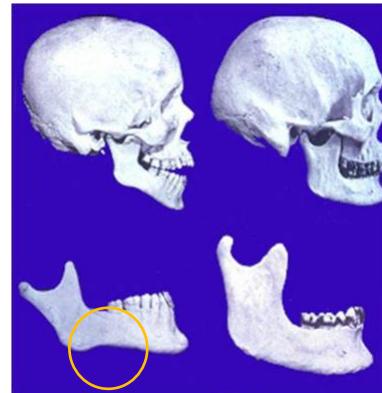


Q: what is antegonal notching? What causes it and where would you see it ? prominent angle of the jaw and curve of the inferior border of the mandible – caused by the excessive force applied by the depressor muscles to open the mouth.

Seen in TMJ ankylosis pts [if ankylosis is bilateral you would see antegonal notch on both sides , if ankylosis is unilateral you would see it only on the affected side]

Q: how is ankylosis diagnosed ?

- 1- History of trauma or infection
- 2- Clinical examination shows limited mouth opening and mandibular movements + healed chin lacerations sometimes
- 3- Radiograph shows no joint space and bones fused together



Q: what happens if ankylosis is not treated?

- Normal growth of face is affected → Nutritional + speech impairment
- Sleep apnea [in bilateral ankylosis]
- Poor and neglected oral hygiene → Multiple carious and impacted teeth

KABAN'S PROTOCOL FOR MANAGEMENT OF TMJ ANKYLOSIS

- 1- Total excision of the ankylosis mass [you need to remove at least 1.5 – 2 cm] – **you have to achieve mouth opening in the operating room**
- 2- Coronoidectomy + myotomy on the affected side to eliminate temporalis muscle restriction.
- 3- Lining with temporalis muscle/fascia [the created joint space is lined with temporalis muscle to prevent reunion of the bones]
- 4- If steps 1 + 2 + 3 do not create enough opening → do opposite side coronoidectomy
- 5- Reconstruction of ramal height with costochondral graft
- 6- **Early post-operative mobilisation and aggressive physiotherapy for at least 6 -12 months**



7- Orthognathic surgery when growth has completed

Management of ankylosis can be:

- **1 stage** : removing the ankylosis and orthognathic surgery to correct class II is done together at the same time
- **2 stages: in younger pts** – you remove the ankylosis in one surgery then do orthognathic surgery when the growth is completed.

Q: why are rib costochondral grafts used in management of ankylosis? Because they contain bone and cartilage, the cartilage can act as a new growth center for the mandible

Mandibular subluxation: momentary inability to close the mouth from a maximal opening position , happens because the condyle goes anterior to the articular eminence . [self reducing partial dislocation of the TMJ]

Predisposing factors:

- Extended periods of mouth opening [long dental procedures]
- Acute trauma
- Parkinson's / seizures

Treatment : none needed because the pt can self reduce it

Prevention : Make dental appointments shorter + use bite blocks , modify diet [avoid excessive mouth opening]

TMJ dislocation: long lasting inability to close the mouth [the pt cannot self reduce]

Treatment:

- **Reduction should happen before muscle spasm occurs [should be done in the first 30 mins] – if the dislocation happened more than 30 mins ago → you need to reduce it under GA + give muscle relaxants**
- Push the mandible downward, backward and then upward into the condylar fossa

Post op care:

- 1- Limit movement [sometimes the pt's head is wrapped to avoid excessive mouth opening]
- 2- Analgesics

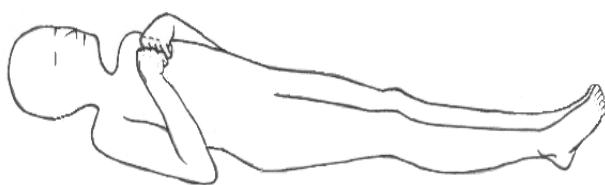
If the TMJ dislocation is chronic surgical treatments can be done to deepen the glenoid fossa or increase the height or the articular eminence by a bone graft or do open eminectomy [remove a portion of the articular eminence to allow the condyle to move freely]



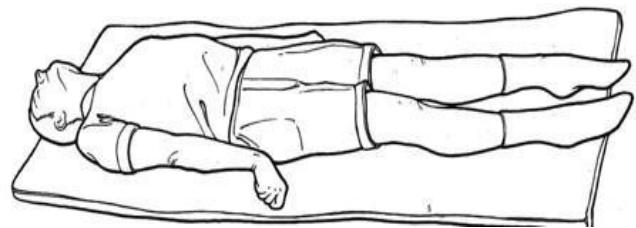
Maxillo facial trauma

Assessment of a trauma patient:

- 1- First do a rapid overall assessment of the pt and **do not concentrate on the most obvious injury**
- 2- Primary survey
 - **A - Airway** maintenance with cervical spine control
 - **B - Breathing** and ventilation
 - **C - Circulation** + hemorrhage control
 - **D - Disability**: determine neurological status
 - **E - Exposure**: completely undress the patient to check for other injuries
- 3- Secondary survey : determine additional external and internal injuries [the pt is evaluated from head to feet – OMF trauma comes at the very end]



Decortication



decerebration

Glasgow coma scale : an objective way to determine the conscious state of a pt

Eye opening	Motor response	Verbal response
Spontaneously =4 Points	Obeys commands = 6 points	Oriented when speaking to person, place and time) =5 Points
To speech and commands = 3 points	Unconscious but can localize pain = 5 points	Confused Disoriented to person, place and time) =4 Points
To pain = 2 points	Withdrawal Response to pain (but can't localize pain)= 4 Points	Words only unconscious but responds to painful stimuli by words) =3 Points
No response = 1 point	Decortication (spastic flexion of the upper limbs and extension of the lower limbs) +Rigidiy = 3 Points	Sounds only = 2 points
	Decerebration (extension and outwards turning of the arms and legs)+ Rigidity = 2 Points	No response = 1 point
	No response = 1 point	



Severe, with GCS ≤ 8 - Moderate, GCS 9 - 12 - Minor, GCS ≥ 13.

- **Highest score is 15/15.** The person in this case is **alert and oriented to person, place and time.**
- **Lowest score is 3/15. There's no Zero.** The patient is in **deep coma** and is considered **brain dead** if he can't breath without a ventilator.

Peaks of mortality :

- A. **First peak :** Occurs within seconds of injury as a result of irreversible brain or major vascular damage
- B. **Second peak :** Occurs between a few minutes after injury and about one hour later (golden hour)
- C. **Third peak :** Occurs some days or weeks after injury as a **result of multi-organ failure or sepsis**

Management of OMFS trauma:

- 1- Take detailed history of how the trauma happened [what was the object , speed etc..]
- 2- Take full medical history + status of tenatus immunization and any allergies
- 3- Physical examination:
 - A. Examine visible wounds
 - B. Check facial symmetry [zygomatic fracture can sometimes only present as facial asymmetry without and swelling or ecchymosis]
 - C. Check for nose deviation / nasal bridge widening
 - D. Check the nose and ears for blood / CSF
 - E. Check for malocclusion + mand movements
 - F. Palpate the face for any step deformity

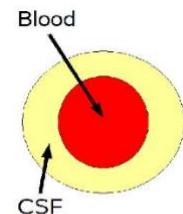


Battle's sign due to posterior cranial fossa fracture



Racoon eyes due to skull base fractures

Q: how would you check for CSF ? checked from nose and ear glass slab – if you see a HALO sign of red in the middle and clear fluid around it → CSF leak]



If you cannot determine if the pt's current malocclusion is due to the accident or not → ask family for any pre accident records like dental casts or photographs [your objective is to establish pre existing occlusion and not correct any malocclusion]

The easiest bone to fracture = nasal bone

The hardest bone to fracture = supra orbital rim



TYPES OF FRACTURES:

- 1- **Simple** [greenstick fractures , fracture with minimal or no displacement]
- 2- **Displaced fractures**
- 3- **Comminuted fractures** : extensive breakage with possible bone / ST loss [difficult to treat because of compromised blood supply]
- 4- **Compound fracture** : fracture that has communication b/w the fracture line and the outside environment
Always associated with lacerations unless a tooth is involved [the tooth will render the fracture compound because it will communicate with the outside environment through the PDL]
- 5- **Pathological** [ex; osteomyelitis, tumors etc.]

Favorable fracture : the muscle attachment will aid in stabilizing the fracture [managed by soft diet and observation for 3 weeks]

Unfavorable fractures : the muscle attachment will displace the fracture more [managed by reduction and fixation]

- A fracture might be favorable in one direction but unfavorable in another direction

Principles of treatment:

- Reduction of fragments in good position
- Fixation
- Immobilization until bony union occurs

These are achieved by: closed or open reduction

- **Close reduction** [fracture site is not exposed and the fractured segments are reduced together guided by occlusion]

- A. **Arch bars** [jelenko, erich pattern , german silver notched] – after being placed on the maxilla and the mandible they must be tied together
- B. **IMF screws** [screws inserted in between the roots of the teeth – 2 in the maxilla and 2 in the mandible then they are tied together to achieve IMF or MMF]
DISADV: screws might cause injury to the roots + unsuitable for children because it will damage the perm tooth bud





- C. **Ivy loops** : one loop is tied around a tooth in the maxilla and one loop is tied around a tooth in the mandible then they are both tied together



- D. **Gunning splints** : used for edentulous pts , base plates that have holes and allow you to tie the acrylic bases together . the acrylic bases are tied to the bone by **circumferential wiring** [a wire that goes all around the jaw]

- **Open reduction** [the fracture site is exposed and the fragments are reduced and fixed]



Osteosynthesis :

Types of plates

- A. **Non-compression small plates**
- B. **Compression plates** [apply force in an upward direction to prevent the fracture from opening up – the disadvantage is that they are very bulky]
- C. **Miniplates** [most common – can be left in the jaw and only removed in case of infection or exposure to the oral cavity]
- D. **Lag screws** [screw that engages the 2 segments together – CAN ONLY BE USED IN OBLIQUE FRACTURES]
- E. **Resorbable plates and screws** [used in children to allow growth]
- F. **Reconstruction plates** [used after tumor removal or big fractures where you need to reconstruct the bone with grafts]

Types of screws:

- 1- Locking : the screw locks into the plate and does not allow any movement between the plate and the screw
- 2- Non locking : allows minor movement between the plate and the screw
- 3- Monocortical : the screw passes only through one bony plate [used in case teeth are involved in the fracture line]
- 4- Bicortical : the screw passes from one cortex to the other

Management of a tooth in the fracture line:

- 1- ABX
- 2- Extract the tooth in case of infection
- 3- In case the tooth is holding the fractured segments together → follow up regularly and extract it only if it becomes infected



Mid facial fractures

Facial buttress system:

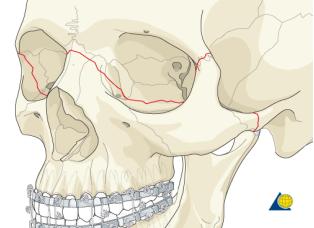
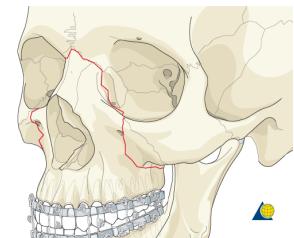
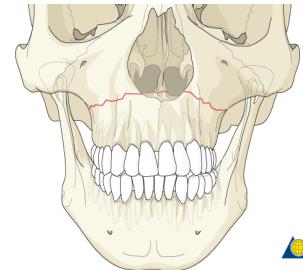
- 1- Naso maxillary buttress
- 2- Zygomatico maxillary buttress
- Both are suspended from the frontal bar - They hold the facial skeleton and in case of facial skeleton fractures you reconstruct the facial buttress first

Le fort I fracture [transverse maxillary fracture]: Horizontal fracture through the maxilla above the level of the nasal floor and alveolar process

Signs and symptoms:

- 1- Impacted type of fracture is often not mobile
- 2- Swelling of the upper lip
- 3- Ecchymosis in upper lip sulcus
- 4- Disturbed occlusion

Le fort II [pyramidal fracture]: involves the nasofrontal suture and zygomaticomaxillary suture



Le fort III [crano facial dysjunction]: separates the facial skeleton from the skull base – the only fracture that involves **the zygomatico frontal suture**

Signs and symptoms of le fort III :

- 1- Dish face deformity **
- 2- Bi lateral subconjunctival hemorrhage
- 3- Bi lateral circumorbital ecchymosis
- 4- Diplopia and enophthalmous
- 5- Lengthening of the face

Closed reduction

- Simple uncomplicated fractures
- Comminuted fractures **
- Medical or surgical contraindications to open reduction
- Maxillary fractures in children**

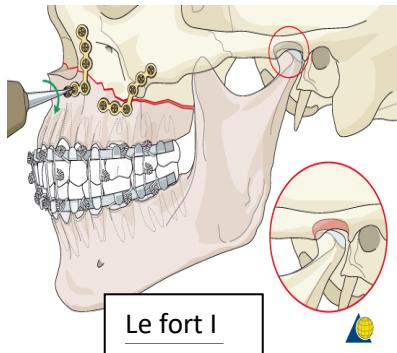
Open reduction indications

- Immediate or early jaw function is desirable
- Difficulty is encountered in reducing the fracture by a closed method
- The fracture is unstable

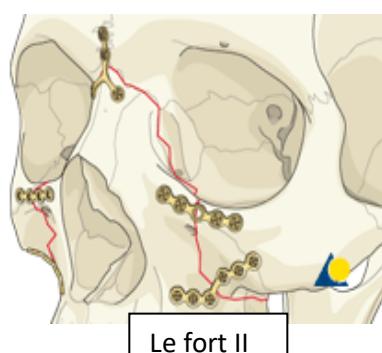


Treatments :

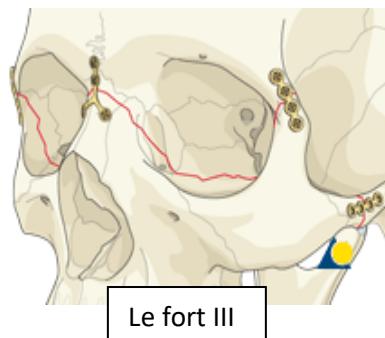
- **Le Fort I:** reduced digitally, MMF, fixation of Zygomatico maxillary suture with bone plates
- **Le Fort II:** MMF , fixation of nasofrontal process and inferior orbital rim
- **Le Fort III:** usually requires coronal flap for adequate exposure and miniplate fixation



Le fort I

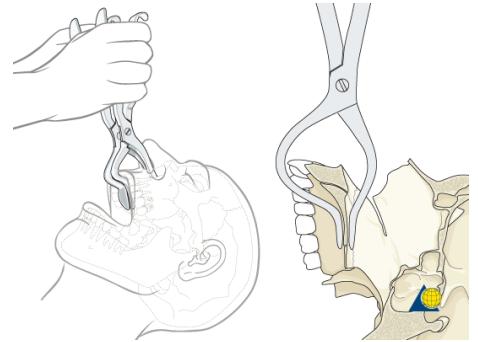


Le fort II



Le fort III

Disimpaction forceps are used in cases of malunion , the 2 ends will hold the maxilla and try to mobilize it



Arch bars can be used for closed reduction or in open reduction before the use of bony plates

Plates are placed along the lines of osteosynthesis [sutures]

Zygomatic complex fractures:

- The malar bone is rarely broken , it is usually broken from the 4 processes
- Tripod fracture = malar bone is fractured from 3 out of 4 processes → causing it to rotate and become unstable
- **Henderson's classification:**
 - I- Undisplaced fracture
 - II- **Zygomatic arch fracture only**
 - III- Tripod fracture with **undistracted frontozygomatic suture**
 - IV- Tripod fracture with **distracted frontozygomatic suture**
 - V- Pure blow out fracture of the orbit
 - VI- Fracture of the orbital rim only
 - VII- Comminuted fracture or other than above

Signs and symptoms of zygomatic complex fractures:



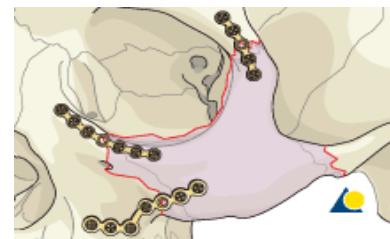
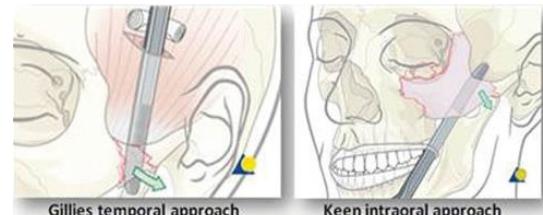
- 1- Periorbital ecchymosis and edema
- 2- Flattening over the zygomatic arch [in case of unilateral zygomatic fracture → facial asymmetry and flattening of the side of fracture]
- 3- Diplopia and enophthalmos
- 4- Unequal pupillary levels

Zygomatic arch fractures are detected by submentovertex

Management of zygomatic complex fractures:

Should be done as early as possible unless there are more series medical complications , then it can be delayed for max of one week

- 1- Gillies approach [temporal approach] – most common
Incision is made in the temporal region – the forceps goes under the fractured segment and reduced it → you will hear a click
- 1- Keen approach [buccal sulcus approach]
Incision is made intraorally – the forceps goes under the fractured segment and reduced it → you will hear a click
- 2- Open reduction and fixation –
 - A. **Frontozygomatic suture**
 - B. **Infraorbital rim**
 - C. **Zygomatic buttress**



Gillies and keen approach → no need to place plates and screws once you reduce the fracture the bone will go back to its place in between the 4 processes that will hold it in place

Orbital blow out fracture: Isolated fracture of the orbital floor with partial herniation of orbital contents into the maxillary sinus [mostly caused by increase in intraocular pressure due to trauma by a blunt object]

- Facial asymmetry
- Enophthalmos
- Diplopia on upward gaze- **impingement of inf. Rectus muscle**

Management:

- Small fracture without any disability → no need for treatment
- Large fracture → surgical reduction



Naso orbital ethmoid injuries [most aggressive and most complicated to treat]:

Signs and symptoms:

- 1- Obliterating swelling [you need to wait until the swelling subsides which might cause malunion]
- 2- Canthus detachment
- 3- Deformity of nasal bridge
- 4- CSF leak

Management:

- 1- Debridement of open wounds + remove foreign bodies
- 2- Obtain good surgical exposure → reduction and stabilization



Mandibular fractures

Any trauma to the **ramus of the mandible , angle or condyle** might damage the facial nerve passing through the parotid gland

- When doing sub mandibular incision , you need to go back **1.5 cm** away from the inferior border of the mandible to prevent damage to the **marginal mandibular nerve** [branch of the facial nerve]
- **Most common site for mandibular fractures = the condyle**

Symphysis fractures:

- **The most common missed fracture (always fine crack)**
 - Can be **symphysial or parasymphysial fracture**
 - Commonly associated with one or both condyles fracture [if there is **symphysial fracture** → check both condyles , if there is **parasymphysial fracture** check the opposing condyle]
 - Long canine tooth represent a weak area and contributes to parasymphysial fracture
- Symptoms of symphysis fracture**
- 1- Pain + Swelling
 - 2- Development of step deformity
 - 3- Mental anesthesia
 - 4- Soft tissue injury to the lower lip and chin

Midline fracture (symphysial)
stabilizes by the action of mylohyoid and geniohyoid muscles

Oblique fracture (parasymphysial)
tends to **overlap** by the action of mylohyoid and geniohyoid muscles

Bilateral parasymphysial fracture
results in backward displacement + loss of tongue control

If symphysis fracture is associated with condylar fractures:

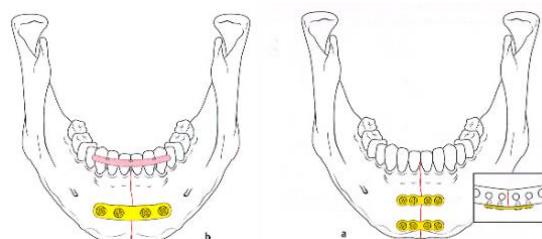
1. Absence of condyle movement on the **contralateral side**
2. Deviation of mandible towards **the affected side**
3. Anterior open bite
4. Limitation of mouth opening

Treatment :

Gold standard for symphysial fractures = rigid osteosynthesis [bone plates and screws] because it allows early return of function

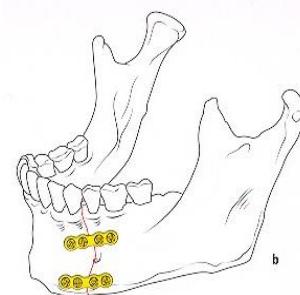
2 scenarios:

- A. **The fracture is anterior to the mental foramen →**
place 2 plates [to avoid the fracture from opening up] OR you can place a compression plate to apply upward force and prevent the fracture from opening up [but it is very bulky]





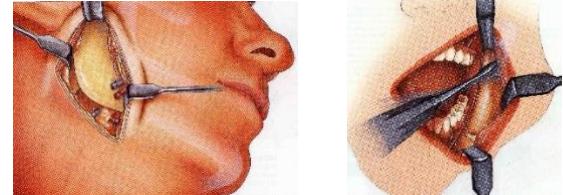
- B. The fracture is posterior to the mental foramen → place one plate only [unless it is an unfavorable fracture then place 2 plates]**



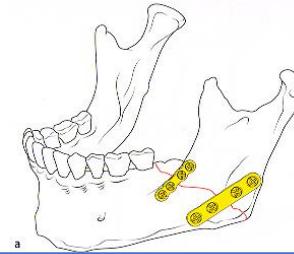
Angle fractures:

Signs and symptoms:

1. Pain + trismus
2. Extra-oral swelling **at the angle**
3. **Step deformity behind the molar teeth**
4. Malocclusion
5. Involvement of **inferior alveolar nerve** [specific for angle fractures]



Treatment: rigid osteosynthesis with either intra oral [transbuccal approach] or extra oral approach [submandibular , retromandibular or pre auricular]



condylar / sub condylar fractures:

The most common mandibular fracture

- **Unilateral or bilateral**
- **Intracapsular or extracapsular**

The condyles displace Antero medially [the attachment of the lateral pterygoid muscles causes the disc to displace antero medially in case of TMD and the condyle to displace antero medially in case of condylar fracture]

Bone has endosteal blood supply and periosteal blood supply , as a person becomes older the endosteal blood supply becomes less and bones depend on periosteal blood supply → communicated fractures are harder to treat in elderly because the periosteal blood supply is compromised by the trauma and by the surgery [very poor prognosis]

Signs and symptoms:

1. Swelling + pain
2. Deviation of mandible towards the affected side
3. **Gagging of occlusion (premature contact on the posterior teeth)**
4. **Anterior open bite on opposite side of fracture**
5. Retroauricular ecchymosis

Treatment : depends on the case but you can either do:

- 1- Closed reduction [arch bar + IMF for 3-4 weeks]
- 2- Open reduction + internal fixation



Q: why is closed reduction considered a tx modality in condylar fractures even though the gold standard is ORIF? Because a lot of vital structures like BVs and nerves pass through this area → IMF is considered to avoid possible injury during ORIF.

Indications to do ORIF in condylar fractures

Absolute indications	Relative indications
<ol style="list-style-type: none">1- Fracture into middle cranial fossa2- Foreign body in the joint capsule3- Lateral extracapsular displacement4- Inability to open mouth or bring the mandible into occlusion after 1 week, with evidence of fracture segment in mechanical path [don't wait for then a week to avoid malunion]	<ol style="list-style-type: none">1. Condylar fracture with comminuted midfacial fractures [the maxilla won't be able to act as a stable base to do closed reduction and fixation]2. Comminuted symphysis fracture and condyle fracture with associated tooth loss3. Displaced condyle fracture in mentally retarded or medically compromised adults with evidence of open bite4. Edentulous mand. with post. Bite collapse

Mandibular fractures in children:

- Fractures with deciduous dentition can be treated with **MMF for 2-3 weeks** because rigid fixation can harm the tooth bud.
- The most feared complication is **ankylosis of the TMJ** with impact on jaw growth that causes severe facial deformity- this is **prevented by doing weekly mobilization**

Q: why is the duration of MMF less in children? Because of higher remodeling ability in children

Q: what is the most feared complication in mandibular fractures in children? And how can it be prevented? TMJ ankylosis which can affect the condylar growth center leading to facial deformity, this is prevented by doing weekly mobilization of the jaws



Orthognathic surgery

Functions of the face:

- 1- Breathing and swallowing
- 2- Speech
- 3- Vision, smell and taste
- 4- Protection of vital organs [brain , eyes etc]
- 5- Recognition

Facial drape = indicates ethnicity and gives an idea about underlying facial skeleton [Ex: proclined lower lip indicates class 3, depressed ST of the cheeks indicates retrognathic maxilla]

Q: what is the difference between orthodontics and orthognathic surgery ? orthodontics move the dentoalveolar segment , orthognathic surgery moves the **dental bases** [whole maxilla or mandible]

Q: orthognathic surgery involves moving which segment of the facial skeleton? the dental base of the jaws

Malocclusion can be adjusted by 3 ways :

- 1- Controlling growth and adjusting muscles with functional appliances [only during growth spurts]
- 2- Controlling teeth and dentoalveolar segment using ortho tx
- 3- Adjust the dental base using orthognathic surgery

NOTE: if the pt has abnormal dentition and it was not bothering them for a very long time they suddenly decide that they want orthognathic surgery → you need to ask for a **psychological assessment** [they might not be satisfied after tx]

Orthognathic Surgery Indications:

- 1- Malocclusion that cannot be corrected by orthodontic treatment, due to dental base problem
- 2- Cranio-facial deformity – to improve facial soft tissue profile
- 3- Obstructive sleep apnea due to maxillofacial skeletal problem [**Most commonly severe class II**]

Steps in Orthognathic Surgery Planning

- 1- Assessment by surgeon and orthodontist (combine Clinic)
- 2- **Pre surgical orthodontic treatment** (for decompensation of dento-alveolar components)
- 3- Orthognathic surgery (for correction of the skeletal base)
- 4- **Post surgical orthodontic treatment** (for final establishment of occlusion)
- 5- Retention period (to prevent relapse)

In pre surgical orthodontics the teeth are set according to the desired occlusion after surgery

Q: what are the records that you need to obtain before orthognathic surgery ?



- 1- Photographs [multiple views in static and smiling positions]
- 2- Radiographs [OPG] + lateral ceph
- 3- Cephalometric analysis
- 4- Dental cast / dental articulator
- 5- Models [obtained by 3d printing the pt's CT scan]

Orthognathic surgery can only change the middle and the lower facial 3rd. the upper facial 3rd needs collaboration with neurosurgery.

- The most important esthetic component is : the position of the upper incisors in relationship to the lower lip
- Ideally the upper lip covers the wet line of the lower lip
- In class III the mandible moves forward and the wet line of the lower lip is exposed an dry.

Q: who is involved in craniofacial clinics that manage orthognathic surgeries?

- 1- Orthodontist
- 2- Oral maxilla facial surgeon
- 3- Pediatric dentist
- 4- Speech therapist
- 5- Psychologist
- 6- Dental technician

Retruded chin causes ACUTE labiomental angle → genioplasty is done to make it more obtuse

Q: the most common cause of chin deviation ? condylar hyperplasia on one side only

before operating you need to inject Tc 99 to check if the condyle is still growing or not. If it is still growing you can't operate

Bi dental sounds : TH [the tongue between the 2 arches]

If the mandible is too far forward → bi dental sounds would be S not Th

In class II → acute labiomental angle

In class III → obtuse labiomental angle

orthognathic surgery types

Genioplasty	Adjust the chin [mandibular symphysis] to make it either more or less prominent
Bilateral sagittal split osteotomy [BSSO]	Brings the mandible forward or pushes it back [mandibular set back] https://www.youtube.com/watch?v=oQI8L5Sxa6w
Le fort 1 maxillary advancement	Brings the maxilla forward to correct mid facial hypoplasia / maxillary retrusion / dish face appearance https://www.youtube.com/watch?v=zBSCsfwOos

- Le fort I advancement will bring both the upper and the lower lips forward and the nose will be elevated a few mm



- To correct dish face [mid facial hypoplasia] → bi maxillary operation [maxillary Ie for 1 advancement + bilateral sagittal split osteotomy to push back the mandible]
- Most cases of le fort II advancements are combined with le fort 1 [because you cannot achieve edge to edge occlusion with le fort II alone]
- If the pt has sever class II mandibular retrusion and you cannot intubate them → do tracheostomy
- Obstructive sleep apnea and snoring can be caused by sever class II

Q: how can doing a BSSO and mandibular advancement fix obstructive sleep apnea? If the mandible is retruded the tongue will fall back into the pharynx causing snoring and obstructive sleep apnea , by advancing the mandible you bring the mandible and tongue forward → opens the posterior pharyngeal space

Q: what are the immediate post op sequale ?

- 1- Airway obstruction due to edema in submandibular region
- 2- Post operative bleeding from the osteotomy sites in maxilla and mandible
- 3- Numbness of lip, tongue, cheek due to nerve injury [temporary for a few months only

Injury to the IAN during BSSO → numbness in the lower lip
Injury to the inferior alveolar nerve during le fort 1 maxillary advancement → numbness in the upper lip

Q: how can you check for maxillary canting ? asking the pt to bite on a wooden tongue depresser

The occlusal plane should be parallel to the interpupillary line

NOTES: cases of maxillary canting require PA skull cephalometry and lateral chepalometry



Q: what does it mean if the maxillary canting is associated with eye canting? It indicates that the deformity happened during early childhood and it might be associated with skull base canting

Q: what are the complications of orthognathic surgeries?

- > Numbness of the lips, tongue, and cheek due to nerve injury
- > Relapse
- > Psychological and emotional impact



Cleft lip and palate

Q: why is cleft lip and palate very difficult to prevent ? Because they occur very early in embryonic life [7- 12 week of intrauterine life] and they are multifactorial

- Most to least common: **cleft lip and palate → isolated cleft palate → isolated cleft lip**
- The majority of unilateral and bi lateral cleft lips are associated with cleft palates
- Bilateral cleft lips are associated more with cleft palate than unilateral cleft lips
- Unilateral clefts are 9 times more common than bilateral clefts and occur twice as frequently on the left side
- Male mostly get cleft lip and palate
- Isolated cleft palates are almost exclusive to females
- Isolated cleft palates are associated with hypernasal voice [because the air goes through the nose during speech]
- Africans have the **lowest incidence** and prevalence of CL/P
- Europe and asia have the **highest incidence** and prevalence
- Majority of CL/P is non syndromic

Q: what are the possible causes for CL/P?

Environmental	Genetic
1- Intrauterine exposure to the anticonvulsants [phenytoin] 2- Maternal smoking and Alcohol consumption	<ul style="list-style-type: none"> • The most common syndrome associated with CL/P = van der woude syndrome • The most common syndrome associated with isolated cleft palate = Microdeletions of chromosome 22q resulting in Velocardiofacial, DiGeorge, or conotruncal anomaly syndromes

Classification of clefts:

- 1- Unilateral cleft lip – complete and incomplete
- 2- Bilateral cleft lip
- 3- Unilateral cleft lip and palate
- 4- Bilateral cleft lip and palate
- 5- Cleft palate only



Isolated cleft lip



Unilateral cleft lip and palate + alveolus



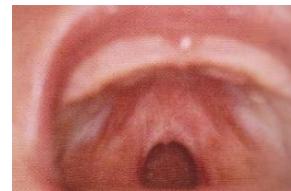
Cleft lip and alveolus



Bilateral cleft lip



Bilateral cleft lip and palate



cleft palate [on the soft palate only]



cleft palate [hard and soft palate]

In most cases the cleft is between the lateral and the canine

In cases of bilateral cleft lip and palate [if the cleft is left untreated] → the canine will not erupt because there is no bone in that area

- Palatal shelves begin to fuse at week 7 and end at week 12 and fusion occurs antero-posteriorly – if the deformity happens at week 7 → full cleft , but if it happens at week 11 → cleft in the soft palate only
- Clefts can be detected by ultrasound at 32 weeks [8 weeks before delivery]

Q: what are the complications [problems] of CL/P?

- 1- Feeding and swallowing problems
- 2- Speech problems
- 3- Esthetic problems [facial deformity]
- 4- Hearing problems
- 5- Abnormal eruption and dental anomalies
- 6- Malocclusion [class III]
- 7- Fistula

Q: why do CL/P children have speech problems? Because they cannot hear well

Q: when is a CL/P child seen for speech therapy ? at 5 yo

Q: what would you do if a child at 5-6 years does not speak ? check their hearing

- Normally the infant pushes the nipple of the breast or the bottle with their tongue against the hard palate but in CL/P the palate has a hole in it so the baby cannot push the nipple against the palate [those children are usually fed with a small spoon] .
- Ideally mothers are trained on feeding their infants with CL/P before the baby is born [if the CL/P is detected on the ultrasound]
- CL/P infants cannot swallow properly because they cannot achieve anterior oral seal

Q: why do CL/P infants become very tired when you feed them ? because they exert a lot of energy to swallow since they cannot achieve an anterior oral seal



Q: when is lip repair done for CL/P? when the baby is 10 weeks old [3 months] + has hemoglobin of 10 g/dl and a weight of 10 pounds [rule of 10]

Q: why can't be repair both the lip and the palate at 3 months ? because at 3 mm the baby is very small can't afford excessive blood loss therefore lip repair is done at 3 months and palate repair is done at 8-12 months

Q: why can't you repair soft and hard palate together ? if the hard palate is repaired early there will be a scar that prevents lateral expansion of the palate , while the mandible continues to grow → crossbite

Q: what dental abnormalities does cleft lip and palate cause ?

- 1- Hyperdontia [if the cleft divides the tooth bud]
- 2- hypodontia [if the cleft prevents the tooth bud from forming]
- 3- abnormal tooth size [macrodontia]
- 4- abnormal tooth alignment

- saying letter K : the soft palate goes upward and closes the nasopharynx from the oropharynx → forcing all of the air through the mouth
- saying Ah: little amount of air has to go through the nose

NOTE:

- if the cleft palate is not repaired → the child will not be able to say K
- if the cleft lip is not repaired → the child will not be able to say the bilabial sounds [mama, baba]
- if the teeth erupt in an abnormal position → the child will not be able to say tongue to alveolus words [la la]

Q: why do CL/P children develop conductive deafness?

The secretions of the middle ear are drained from the middle ear into the pharynx by the eustachian tube - In CLP the palatopharyngeous muscle is involved [which is attached to the eustachian tube that is connected to the middle ear] → the opening of the eustachian tube into the middle ear is blocked → secretions cannot drain into the pharynx and accumulate in the middle ear and the ear is glued → conductive deafness at the side of the cleft [if bilateral cleft → deafness at both ears, if uni lateral cleft deafness at the ear at the side of the cleft].

- Once you treat the cleft the tube opens a little bit , but you still need to refer the child to an ENT specialist
- You refer all CL/P children to the ENT [regardless if they can't hear or they hear normally]
- You can test for hearing in the first day of life but you cannot test for vision
- Management of CL/P is multidisciplinary from birth till 20 years of age [reviewed every 3 months]



Q: reasons for bone grafting in CL/P pts?

- 1- Connect the separated segments of the maxilla and make them as one bone [to stabilize occlusion]
- 2- To isolate the nasal cavity from the oral cavity
- 3- To allow the canine to erupt
- 4- Provide harmonious arch for balanced occlusion
- 5- For esthetics [to lift the base of the Ala of the nose]

Dento alveolar collapse happens if the lip and the palate are repaired without bone grafting

- Most cases of CL/P end up with class III malocclusion [because of the prevention of the forward growth of the maxilla by the scar in the pterygoid region and the lip scar anteriorly]

Scars and growth prevention:

- The lip scar anteriorly → prevents forward maxillary growth
- The midline palatal scarring → prevents lateral maxillary growth
- Posterior palatal scarring → prevents forward maxillary growth

Q: what is your role as a dentist for CL/P patient?

- 1- Counseling with family
- 2- Constructing a feeding plate
- 3- Oral hygiene care [try to preserve teeth + fluoride application]

Q: who is involved in managing a CL/P patient ?

- 1- Pediatric dentist
- 2- Orthodontist
- 3- Oral surgeon
- 4- Speech therapist
- 5- Psychologist

Sequence of management

Counselling	Day one of life
Lip repair + social support	3 months
Soft Palate repair	8 – 12 months
ENT examination for hearing	1 YO
Speech therapy	1-5 years
Hard palate repair	5-7 YO
Alveolar bone grafting + psychological support	8-12 YO
Orthodontic TX	12-16 YO
Orthognathic surgery	18-20 YO



Lasers in oral surgery

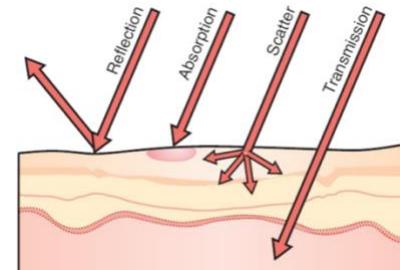
Q: characteristics of laser light?

- Monochromatic [contains a single color]
- coherent [all light waves are moving together through time and space]
- directional [well collimated]

Laser	Absorbing tissue	Use
Er: YAG	Water + HA	Ablation of hard tissue + Cutting of soft tissue +Coagulation + Disinfection
Nd: YAG	Melanin + hemoglobin	Cutting soft tissue + Coagulation + Disinfection
CO2	Water	Cutting soft tissue + Disinfection
Diode	Melanin + hemoglobin	Cutting + disinfection

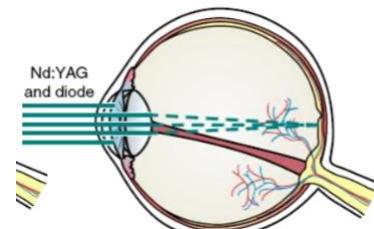
Q: How does laser interact with tissue ? Reflection, transmission, scattering, absorption

CAUTION : a laser used with titanium implants could be redirected to the dentist's eyes



The diode and Nd:YAG laser are transmitted through sclera, cornea, lens, aqueous humor & vitreous body of the eye before being absorbed on the retina

- CO2 & Er:YAG lasers interact with the cornea and lens
- Nd:YAG & diode lasers penetrate to the retina.



Q: what are the photobiological effects of laser?

- Photothermal [used for incision and excision, ablation , coagulation]
- Photochemical [disinfection of periodontal pockets and endodontic canals]
- Photobiostimulation [Low level laser therapy- **cold laser** for pain relief , anti inflammatory effect, better healing of wounds]



- Photo aucostic

Q: Mention some of the uses of laser in dentistry?

- Excisional biopsy
- Excision of hypermobile tissue
- Frenectomy and Ankyloglossia treatment
- removal of gum pigmentation
- remove mucocele and vascular lesions

Q: mention some of the hazards of laser?

- 1- Combustion hazards [laser should not be used next to flammable materials]
- 2- Eye hazards [special eye google are mandatory to be used when using laser]
- 3- Skin hazards [burns]
- 4- Laser plumes may contain carcinogens, irritants, viruses etc]

NOTE: exposure to laser plume can lead to general flu like symptoms

Q: how to prevent laser hazards? Proper ventilation and evacuation system + Protective equipment (mask,eye protection)



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